TEST PROCEDURE

TP 707K

Title	**Page Number**
Sample Collection of Exhaust Emission Tests	1 of 68

Originator	**Supersedes**
Thaddeus J. Cieslak, Mechanical Engineering Technician	TP 707H

Responsible Organization	**Computer Program** 1200 System and VDA System
Testing Services Division - Vehicle Testing	

Type of Test Report	**Data Form Number**
Computer	Form 707-01

Report Distribution Certification Division, Manufacturer's Representative, and Program Office requesting the test	**Implementation Date** 02-01-99

Implementation Approval

Original Test Procedure Authorized by EPCN #113 on 08-24-92

Revision Description

(1)   02-01-99 The purpose of this change is to revise the procedure as described in EPCN #228.

Note: Specific brand names in EPA/EOD procedures are for reference only and are not an endorsement of those products.

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Attachments

1.   **Purpose**

The purpose of this procedure is to collect samples of the gaseous emissions in the exhaust of gasoline-fueled vehicles during the Federal Test Procedure (FTP) or the Highway Fuel Economy Test (HFET).

Unless otherwise specified, the driver is responsible for completing the steps in this procedure.

2.   **Test Article Description**

Light-duty vehicles scheduled for Certification, Fuel Economy, Enforcement, or other testing.

The 48" single-roll electric dynamometer referenced in this procedure is approved only for use in testing Emission Factor vehicles or other special testing projects as designated by the project officer.

3.   **References**

3.1   "Code of Federal Regulations," Title 40, Part 86, Subpart A, Section 86.082, and Subpart B, Sections 86.105, 86.106, 86.107, 86.108, 86.109, 86.111, 86.113, 86.115, 86.127, 86.128, 86.129, 86.130, 86.135, 86.136, 86.137, 86.140, 86.142, and Appendix I

Part 600 Subpart B, Sections 600.106, 600.109, 600.110, 600.111, and Appendix I

3.2   Environmental Protection Agency (EPA) Test Procedure, TP 703

All references include procedures referenced and all subsequent revisions thereof.

3.3   "Macintosh Plus Manual" #M1503

3.4   MacAcademy training video cassette, "Basic Macintosh"

3.5   Memo, R. Lawrence, March 11, 1983, Subject: "Evaluation of Vehicle Acceleration Rate Compliance"

3.6   See TP 703 for the 48" single-roll electric dynamometer power start-up and power shutdown procedures.

3.7 Letter to manufacturers from Robert Maxwell, CD-88-16 (9/27/88), "Test Procedures at MVEL"

3.8 "Horiba Dynamometer Operation Manual" #091944, November 1993

3.9 "ASTM Rounding Off Procedure," July 15, 1990

3.10 EPA current safety policies

4. Required Equipment

4.1 Form 707-01, "Sample Collection/Analysis Site Verification" (Attachment A)

4.2 Form 708-01, "Vehicle Test Data Sheet" (see TP 708)

4.3 Form 801-01, "Data Location"

4.4 Form 902-01, "Test Status Report"

4.5 Ambient Temperature Label

4.6 Vehicle Specifications Report (VSR)

4.7 Video Driver's Aid (VDA) System:

    4.7.1 Data Acquisition Microcomputer

    Equipment used: Macintosh Plus Model #M0001A with Relax Technology 45 Megabyte Hard Disk Drive Model #C46668

    4.7.2 Video Monitor

    Equipment used: Electrohome Electronics Model #38-V19NWB-AP

    4.7.3 Data Acquisition Device

    Equipment used: Taurus Model IDAC 2000

    4.7.4 Laboratory Network System (LNS)

4.7.5   Printers

Equipment used: Apple LaserWriter

Hewlett-Packard Laser Jet

4.8   Chassis dynamometer (dyno):

4.8.1   Twin-roll hydrokinetic dynamometer

Equipment used: Clayton ECE-50 with a power absorption unit to simulate the road load power and flywheels to simulate the vehicle's equivalent test weight

4.8.2   48" single-roll electric dynamometer and data acquisition equipment

Equipment used: Horiba LDV-48-86-125HP-AC Single Roll 48-Inch Electric Dynamometer with:

CDC-900 Computerized Dynamometer Controller

RTM-200 Real-Time Monitor Computer

CTM250G Microterminal

Power Converter, Power Exchange Unit (PEU), torque measuring system, and speed measuring system

4.9   Dynamometer roll revolution counter (used with twin-roll hydrokinetic dynamometer)

Equipment used: KLT-Custom fabricated to EOD specifications

4.10   Vehicle restraint system for:

4.10.1   Twin-roll hydrokinetic dynamometer, rear drive type:

Cable winch, permanently affixed to the test cell floor, to restrain the test vehicle horizontally on the dynamometer to minimize vehicle rocking

Equipment used: Little Mule Products Model #B2 Puller Hoist

4.10.2   Twin-roll hydrokinetic dynamometer, front drive type:

Cable winches, permanently affixed to the test cell floor, or anchor hooks attached to the dynamometer frame, and tie-down straps to restrain front-wheel drive vehicles on the dynamometer

Equipment used: Little Mule Products Model #B2 Puller Hoist
or Eastern Rotorcraft Corp. Tie-Down Part #SP-4212-1

4.10.3   Twin-roll hydrokinetic dynamometer, wheel chocks

Equipment used: Clayton
or airplane-style chock blocks

4.10.4   48" single-roll electric dynamometer, wheel chock assembly

Equipment used: Single-roll dynamometer wheel chock assembly, fabricated per EOD requirements

4.11   Exhaust Connectors:

4.11.1   Flexible exhaust tubes

4.11.2   Exhaust tube adapters

4.11.3   Clamps

4.11.4   Gaskets and boot assembly

Equipment used: All the above are fabricated to meet EOD requirements; see Laboratory Engineering Branch (LEB) blueprint file drawings TO4 88B-(0-11).

4.12   Exhaust Gas Sampling System:

4.12.1   Critical Flow Venturi-Constant Volume Sampler (CFV-CVS)

Equipment used: Philco-Ford Model #CVS-20
or Horiba Model #1050 CVS Heat/Cool/Filter

4.12.2 CVS Compressor Unit (Blower)

Equipment used: Spencer Turbine Co. Model #2007-H Turbo Compressor or Horiba Model #1050 Compressor

4.13 Compressed air supply with air hose, tire inflation chuck, and calibrated pressure gauge

4.14 Fixed speed cooling fan with a capacity not exceeding 5,300 cubic feet per minute (cfm). Additional or special cooling fans may be used if approved in advance by Certification Division or the appropriate Task Officer.

Equipment used: Hartzell Fan Model #N24-DUWS

4.15 Lab Computer System (LCS) interface unit and Test Analysis Processor (TAP) Program

Equipment used: Datasouth Computer Corporation Model #DS120 Terminal (a converted Digital Equipment Corp. Decwriter II Terminal Model #LA36DK) with pressure-sensitive three-part paper and ribbons stored in its vicinity, and the analyzer/LCS interface panel located on the analyzer control module

4.16 Test Cell Ambient monitoring system:

4.16.1 Type "J" thermocouple and temperature/millivolt transmitter, or thermocouple thermometer connected to TAP, or to a strip chart recorder

Equipment used: Leeds and Northrop Temperature/Millivolt Transmitter Model #Centry 479

Omega Engineering Thermocouple Thermometer, Model #199

Strip Chart Recorders:
Soltec, Model #33112-2 or #3316-6
Hewlett-Packard, Model #7132A

4.16.2 Dew-Point Hygrometer located in the test cell, interfaced with LCS

Equipment used: General Eastern 1200 APS

4.16.3 Digital Barometer, centrally located, interfaced with LCS

Equipment used: Mensor, Part No. 0011900402F

5. **Precautions**

5.1 For the FTP, the vehicle's ignition key must remain in the "Off" position until the start of the test. Turning the ignition to "On" can affect the engine fuel system.

5.2 For the FTP, the vehicle's windows must remain down during the 12- to 36-hour soak period on those vehicles equipped with power windows, since turning the key to the "On" position before the test may affect the fuel system.

5.3 The dynamometer must be warmed up before use.

5.4 The driver must not use the test vehicle brakes and accelerator simultaneously; therefore, brakes and accelerator must be operated sequentially using the same foot.

5.5 The restraint system that secures the test vehicle on the twin-roll hydrokinetic dynamometer must have the slack removed so approximately 2 inches of play is at the center of the cable or strap for a front-drive system, 4 inches for a rear-drive system.

5.6 The restraint system that secures the test vehicle on the 48" single-roll electric dynamometer must be adjusted to position the vehicle's drive wheels approximately at the roll surface crown.

5.7 When the test vehicle is connected to the CVS, care must be taken to avoid putting excessive strain on the vehicle's exhaust system. The CVS blower must be operating when the vehicle's engine is running.

5.8 The exhaust scrubber system (accessed through the test cell floor) must be on and operating properly.

5.9 The vehicle starting procedures must be with the vehicle.

5.10 The test cell door(s) must be closed before starting the vehicle engine and while it is operated on a dynamometer.

5.11 The driver must remain inside the vehicle in the proper driving position at all times while it is being operated on the dynamometer.

5.12 The test vehicle must be correctly aligned on the dynamometer prior to testing.

5.13 The 48" single-roll electric dynamometer contactor must be engaged and the "RUN MODE" must be selected before driving the test vehicle.

5.14 The 48" single-roll electric dynamometer contactor must be disengaged before removing the test vehicle.

    5.15   Personnel in the test cell should avoid close proximity to the test vehicle when the 48" single-roll electric dynamometer roll cradle is raised or lowered.

6.   Visual Inspection

    6.1   Inspect the boots, gaskets, and connecting pipes used between the vehicle and the CVS for leaks and ensure that the CVS I/M port is capped.

    6.2   Inspect the floor exhaust scrubber system for air flow and notify the Building Services Contractor if it needs to be turned on.

    6.3   Inspect the 48" single-roll electric dynamometer and ensure that the contactor is engaged and the "RUN MODE" is selected before driving the test vehicle.

7.   Test Article Preparation

If the dyno has not been operated during the two-hour period immediately preceding the FTP, it must be warmed up for 15 minutes by operating at 30 miles per hour (mph) using a non-test vehicle or as recommended by the dynamometer manufacturer. If this is the first test of the day on a 48" single-roll electric dynamometer, a dyno warmup procedure must be performed, followed by an automatic calibration procedure and parasitic loss calibration, if necessary.

For the FTP, the vehicle must have been preconditioned by operation on chassis dynamometer through one cycle of the "EPA Urban Dynamometer Driving Schedule" (see TP 703). This must be followed by a 12-36 hour soak, refueling, and if required per CFR 86.130, canister preconditioning.

The HFET is designed to be performed immediately following the FTP. In the event the test cannot be scheduled within 3 hours, which may include a 1-hour hot-soak evaporation loss test, the vehicle must be preconditioned (TP 703). If the vehicle been moved outdoors, or to environments where the soak temperature is not controlled, it must be soaked at 68-86 °F for a minimum of 4 hours prior to performing the preconditioning UDDS in order to properly set tire pressure.

Unless otherwise indicated, the driver is responsible for ensuring that the following preparatory steps are performed.

    7.1   On Form 707-01, record the following:

        Vehicle ID #

        Test Number

        Select test type as FTP or HFET

7.2   (Site Operator) Approximately 10 minutes before the test is to begin, notify the manufacturer's representative. If a representative cannot be reached within 10 minutes, begin the test. The test may be delayed for 5 additional minutes if the representative is observing a test on another dynamometer, providing the other time constraints are not violated.

7.3   (Site Operator) Ensure that the test cell air handling system is operating and in the "Test" position and power is applied to the dew-point hygrometer. Fuel Economy Data Vehicles only: The dry-bulb temperature should be 75 ±2 °F and the humidity controller should be set such that the dew-point hygrometer reads 45-50 °F (the target is 47.5 °F) at the start of the test. The dew-point hygrometer flow setting must be 2.0 standard cubic feet per hour (scfh).

If the dew point reading is outside the range of 42-52 °F at any point during the test, adjust the humidity controller slightly as needed to return the dew point to the 45-50 °F range. If the dry-bulb temperature or dew point is not within its respective limits, notify the VT senior technician and/or the Building Service Contractor.

7.4   If the dynamometer (hydrokinetic or electric) has been operated within the last 2 hours, record the dyno's last usage time on Form 707-01 and go to Step 7.6.

If the twin-roll hydrokinetic dyno has not been warmed, the following steps describe the warmup procedure. Go to Steps 7.5 for the 48" single-roll electric dynamometer warmup procedure.

Note: The dyno may be warmed with the test vehicle if a preconditioning LA-4 is required for the HFET. The test vehicle can not be used to verify the horsepower.

7.4.1   Drive the warmup vehicle onto the dynamometer and position the drive wheels on the rolls.

7.4.2   Ensure that the dyno roll brake is engaged.

7.4.3   Set the dynamometer inertia weight (equivalent test weight) to the value specified for the vehicle.

7.4.4   Check that the indicated horsepower (IHp) is set correctly. The IHp is obtained from the chart of actual horsepower (AHp) vs. IHp, posted on each dyno.

If the AHp required is not listed, calculate the IHp using the coefficient for the specific inertia weight on the chart. Use the "ASTM Rounding Off Procedure" to determine the correct horsepower to the tenth place. The coefficient will be different for each dyno; therefore, be sure to use the chart posted on the dyno.

7.4.5   Press the dyno "Index" light button, located on the Road Load Power Control (RLPC) box.

While the light is flashing, select the indicated horsepower using the thumbwheels on the dyno RLPC box. Ensure that the horsepower is set during the flashing light sequence; if it is not set during this period, press the index light again and enter the horsepower while the light is flashing.

If the light either fails to flash or will not stop flashing, notify Calibration & Maintenance (C&M).

7.4.6   Release the dyno roll brake when the "Index" light stops flashing.

7.4.7   Ensure that the correct inertia weights are engaged by lifting the cage and rolling the flywheels with your foot.

7.4.8   Center the drive wheels on the dyno rolls by operating the vehicle in a forward gear momentarily until the vehicle is centered. Ensure that the drive-tires have adequate side clearance from the dynamometer frame so they will not rub and become damaged.

If the vehicle fails to center properly, or there is not adequate clearance, notify the VT senior technician.

7.4.9   Connect the vehicle restraint system. The rear-drive system must have the slack removed and allow approximately 4 inches of play at the center of the cable or strap. The front-drive system must have the slack removed and allow approximately 2 inches of play at the center of the cable or strap.

Do not overtighten the cable.

7.4.10   Connect the vehicle exhaust to the exhaust scrubber system or CVS unit.

If the CVS is used, ensure that the CVS exhaust hose is inserted in the exhaust scrubber system and it is not crimped.

7.4.11   Open the hood or engine compartment cover.

7.4.12   Position the cooling fan(s) within 12 inches of the vehicle (unless otherwise specified) and turn the power to the cooling fan(s) on.

7.4.13   Place the wheel chocks in front of the non-drive wheels.

If airplane style chocks are used, position each around a non-drive wheel of the vehicle and tighten them until they fit snugly around the tire.

7.4.14   If the vehicle is connected to the CVS sample collection unit, turn the CVS blower on.

7.4.15   Accelerate the warmup vehicle to 30 mph and maintain that speed for a minimum of 15 minutes.

7.4.16   While maintaining 30 mph, switch the front/rear roll switch to the front roll position.

7.4.17   Accelerate the warmup vehicle to 50 mph front roll speed and verify the horsepower meter reading. Horsepower readings must be within 0.2 hp of the thumbwheel set point. Out-of-tolerance readings should be reported immediately to C&M.

7.4.18   After the horsepower verification, return the front-rear selector switch to the rear roll position.

7.4.19   On Form 707-01, in the "Record last dyno usage time" section, record the time at the end of the warmup (or preconditioning LA-4). The test must begin within 2 hours after the dynamometer was last operated.

7.4.20   Disconnect the warmup car from the CVS or exhaust scrubber system. Disconnect the vehicle restraint system, remove the wheel chocks, move the cooling fan(s) out of the way, engage the dynamometer roll brake, and drive the vehicle out of the test cell.

7.4.21   Go to Step 7.6.

7.5   The following steps describe the prep sequence for the 48" single-roll electric dynamometer and are performed using the RTM-200 computer, keyboard, and monitor located in the test site control room. The symbols < > are used to indicate a key on the computer keyboard.

Example: Push <1> to start. This means that you need to push the key labeled "1" to start the device.

Comments may be entered during warmup, automatic calibration, and parasitic loss calibration after pressing <F2>.

Note: For 48" single-roll electric dyno power start-up and power shutdown procedures, see TP 703, Sections 7 and 8.

7.5.1   Select "Warm Up" from the "DYNAMOMETER MAIN MENU" screen. The screen will appear in the setup mode.

If warning messages are displayed, address the warnings, see "Horiba Dynamometer Operations Manual."

7.5.2   Look at the monitor screen and ensure the following:

"BRAKE" is "OFF" by pressing <F4>

"CRADLE" is "DOWN" by pressing <F6>

"COVER " is "ON" by pressing <F5>

7.5.3   Start the dyno warmup by pressing <F1>. After approximately 5.5 minutes, the message "DYNO IS WARM" will appear at the top of the screen.

If a message other than "DYNO IS WARM" appears, contact C&M.

7.5.4   Return to the setup mode of the "WARM UP" screen by pressing <F1>.

7.5.5   Stop the rolls by pressing <F8>, then <Enter>.

7.5.6   Record the time at the end of the warmup in the "Record last dyno usage time" section on Form 707-01. The test must begin within 2 hours after the dynamometer was last operated.

7.5.7   If the automatic calibration procedure has already been performed for the day, go to Step 7.6. An automatic calibration procedure should be performed on a 48" single-roll electric dynamometer following the first warmup procedure of each day.

7.5.8   From the "DYNAMOMETER MAIN MENU" screen, select "Automatic Calibration." The "AUTOMATIC CALIBRATION" screen will appear in the setup mode.

7.5.9   Start the calibration by Pressing <F1>. Measurements will be automatically taken at the "OFFSET READING SPEED" of 5 mph. Upon completion, the message "Test Done" will appear on the screen. Press <F1> to return to the setup mode.

7.5.10   Look at the "Change" row. The value under "OFFSET" should be less than 0.5 pounds and the values under "+SHUNT" and "-SHUNT" should be less than 2 pounds.

7.5.11   If the change in the "OFFSET" is more than 0.5 pounds or the change in the "SHUNT" value(s) is more than 2 pounds:

Update the values by pressing <Y> in response to the prompt "USE THESE VALUES NOW? (Y/N)."

Print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P>. Forward the printout to C&M.

Exit the setup mode by pressing <F1>. The dyno will automatically rerun the automatic calibration.

If the change in the "OFFSET" is more than 0.5 pounds or the change in the "SHUNT" values is more than 2 pounds after rerunning the automatic calibration, print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P> and stop pending determination of the dyno status by C&M.

If the "OFFSET" value shows a change of more than 0.5 pounds after completion of the 5 mph reading, the automatic calibration may be stopped manually, the new "OFFSET" values updated, and the "AUTOMATIC CALIBRATION" screen data printed. This allows the automatic calibration to be rerun before the "SHUNT" checks are completed and permits adjustment of the "OFFSET" values without affecting the "+SHUNT" and "-SHUNT" values.

7.5.12   If the "OFFSET" is less than 0.5 pounds and the "+SHUNT" and "-SHUNT" values are less than 2 pounds:

Press <F1> to return to the setup mode.

Press <N> in response to the prompt "USE THESE VALUES NOW? (Y/N)."

If the "OFFSET" or "SHUNT" values were not updated, go to Step 7.6.

If the "OFFSET" or "SHUNT" values were updated, print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P> and forward the printout to C&M. A Parasitic Loss Calibration procedure must be performed.

7.5.13   From the "DYNAMOMETER MAIN MENU" screen, select the password-protected "Parasitic Losses." The "PARASITIC LOSSES" screen will appear in the setup mode.

7.5.14   Ensure that the proper speed points are displayed in the data table at the right of the screen. The speed points are 5-80 mph in increments of 5 mph unless otherwise specified by the test requester.

7.5.15   Ensure the following:

"BRAKE" is "OFF" by pressing <F4>

"CRADLE" is "DOWN" by pressing <F6>

"COVER" is "OFF" by pressing <F5>

7.5.16   Exit the setup mode and start the parasitic losses calibration, by pressing <F1>. When the calibration is complete, the prompt "TEST DONE" will appear on the screen and the dyno will automatically decelerate to a 50-mph warmup speed.

7.5.17   Return to the setup mode by pressing <F1>. The prompt "USE THIS NEW LOSSES CURVE? (Y/N)" will be displayed on the screen.

7.5.18   Look under the "Change LBS" column. The value at any corresponding speed point should not exceed 1.0 lb and the "CURVE FIT r^2" value (lower center of the screen) should be 0.996 or greater.

If the "CURVE FIT r^2" value is less than 0.996:

Press <Y>. in response to the screen prompt "USE THIS NEW LOSSES CURVE? (Y/N)." The loss curve will be saved in the archives, and the dynamometer will return to the setup mode.

Rerun the parasitic losses calibration by pressing <F1>. If the "CURVE FIT r^2" value is less than 0.996 again, stop the dyno prep pending determination of the dyno status by C&M. Print the "PARASITIC LOSSES" screen data by pressing <Alt> and <P> and forward the report to C&M.

If the change in parasitic loss at any speed point exceeds 1.0 lb, indicated by an asterisk alongside the corresponding speed point in the "Change LBS" column, and if the "CURVE FIT r^2" value is 0.996 or greater:

Press <Y>. in response to the screen prompt "USE THIS NEW LOSSES CURVE? (Y/N)." The loss curve will be saved in the archives, and the dynamometer will return to the setup mode.

Print the "PARASITIC LOSSES" screen data by pressing <Alt> and <P> and forward the report to C&M.

If the change in parasitic loss at any speed point does not exceed 1.0 lb for the corresponding speed points in the "Change LBS" column and the "CURVE FIT r^2" value is 0.996 or greater, press <N>. The loss curve will be saved in the archives and the dynamometer will return to the setup mode.

7.5.19   Stop the dynamometer by pressing <F8> followed by <Enter>.

7.6   (Site Operator) Ensure that the CVS sample probe is in "Choke Flow" and that the CVS flow rates are correct. This is accomplished by starting the CVS sample pumps and placing the CVS control test mode selector switch in the "Test 1" position. The sample flow rate must be between 13 and 20 scfh and the "Ashcroft®" vacuum gauge on the CVS dilution box must read a minimum of 12 in. Hg, indicating that the CVS sample probe is in Choke Flow. Repeat this procedure for "Test 2" and "Test 3" positions.

If all checks are within limits, turn off the CVS sample pumps and turn the test mode selector switch to the "Vehicle Test" position.

If either the sample flow or the choke flow vacuum is not within its respective range, call C&M.

7.7   (Site Operator) Place the CVS "Bag Evacuate" switch, under the V-mix readout, in the "ALL" position. Evacuate the sample bags until the CVS "Bags Empty" light is illuminated, and check that all bags are fully evacuated. This is done by visually inspecting the bags. There must not be any air gaps apparent in any of the bags. If a bag appears to have an air gap, notify C&M. Return the "Evac" switch to "Off."

7.8   (Site Operator) Place the CVS selector in the "Fill" position to fill the bags for a minimum of 2 minutes.

7.9   (Site Operator) Fully evacuate all bags as described in Step 7.7.

7.10   (Site Operator) Change the analyzer bench sample filter prior to the first test of the day and perform a leak check as follows:

    7.10.1   Open the filter housing cover located in a recess of the analyzer control unit front panel and remove the old filter.

    7.10.2   Wipe off any filter debris and check that the two "O-rings" are located in their grooves and are not cracked or broken.

    7.10.3   Check that the filter backing plate is properly located, insert a new filter with the rough side up, and close and latch the cover.

    7.10.4   Select the "Front Panel Connector (FPC)" button.

    7.10.5   Insert the quick disconnect fitting into the "Sample" port located on the analyzer control unit front panel.

    7.10.6   Select the "Analysis" buttons for all analyzers and remove the quick disconnect fitting from the sample port.

            If all rotometers go to zero, the analyzer bench leak check is good.

            If any rotometer does not go to zero, there is a leak; notify C&M. Select the "OFF" buttons for all analyzers.

7.11   (Site Operator) Leak check the sample and background bags for each CVS prior to the first test of the day.

    7.11.1   Go to the "Analyzer Control Module" (ACM) in the control room and press the correct "D00#X SAM" button on the "CVS Sample Control" panel. The "X" is the CVS that is to be checked, such as 1, 2, 3, etc.

    7.11.2   On the CVS, select Bag Sample button V17 on the CVS.

    7.11.3   Turn the bag "Evac/Fill" switch to "Evac" until the "Ashcroft®" vacuum gauge on the analyzer control unit front panel is stabilized at the highest reading obtainable and note the reading.

    7.11.4   Turn the bag "Evac/Fill" switch to "Off" and reset the CVS "Elapsed Time" counter by switching the CVS bag fill switch to "Reset" and back to "Vehicle Test."

7.11.5   Monitor the "Ashcroft®" vacuum gauge for 1 minute. If the vacuum reading loss is less than 1 inch of mercury in this 1-minute period, the leak check is good. If more than 1 inch of mercury is lost, the bag is leaking, notify C&M.

7.11.6   Leak check the remaining sample bags individually by repeating Steps 7.11.2 through 7.11.5 for each bag by selecting "Bag Sample buttons" V18 and V19, independently and respectively.

7.11.7   Leak check the background bags individually by selecting the CVS B/G "Sample Control" button and repeat Steps 7.11.2 through 7.11.5 for each bag by selecting "Bag Ambient" buttons V14, V15, and V16, independently and respectively.

7.12   (Site Operator) Ensure that the roll revolution counter power is on and the mode selector switch is in the "Vehicle Test" position (vehicle icon). Reset the counter meters to zero.

Note: If it has not been reset, this timer can be used to determine the previous test completion time.

7.13   (Site Operator) Prepare the terminal to be used for LCS-TAP.

Ensure that the Decwriter terminal has sufficient pressure-sensitive three-part paper and ribbon. Approximately 10 pages of paper are required per test.

Ensure that the Decwriter terminal power switch is on.

Ensure that the eight-key function pad on the left of the Decwriter terminal keyboard is in the following configuration:

The "CAPS LOCK" key is in the depressed position.

LINE LOC: raised

LOC COPY: raised

BAUD RATE: both the 110 and 300 keys are depressed selecting 1200 BAUD

REV CHAN: raised

FDX HDX: raised

AUTO LF: raised

CODE: raised

7.14   (Site Operator) If the LCS-TAP program is not available and the test is to be collected manually, go to Step 7.16. Otherwise, activate TAP on the analyzer site Decwriter terminal as follows:

   7.14.1   Press <BREAK>. The "TSP OPCOM X (or Y) PROD" banner message should appear. If not, call the Computer Room.

   7.14.2   Type "$ACTIVATE TAP" and press <RETURN>. Wait for the active instrument calibrations to be picked up by TAP. This is signaled by the printing of the span point table, and may take several minutes. Several variations of the TAP command are acceptable.

   For example, "$ACTIVATE TAP" and "$RUN TAP" will both initialize the program. All options are listed on the sites, and any option is acceptable to activate the program.

   7.14.3   To enter the test number, press <BREAK>. The "TSP OPCOM X (or Y) PROD" banner message should appear. Enter the dynamometer to be used for testing and the valid 6-character test number found on the Test Vehicle Data Sheet following this format:

   "E (space) DOO?, NNNNNN" (no dash in test number). Press <RETURN>.

   7.14.4   TAP prints the test number, vehicle identification number, version, and test procedure (02, 03, 05), and "Is test information OK? Y/N." Type "Y" and press <RETURN> if the data are correct. Be sure data for both tests are entered if two vehicles are run simultaneously. TAP will respond with "Test Data OK" and will print the span point tables when all input data are correct.

   If the data are not correct, recheck your input data. If an input error is found, type "N" and LCS will respond with "Enter again or use dummy." Re-enter the correct data.

   If the input data are correct and TAP prints incorrect data, contact the computer room.

   7.14.5   Verify that the span points printed on the TAP printout agree with those posted at the analysis site.

   If they do not agree, press <BREAK>, type "G," and press <RETURN> to check for updated span point tables. If the span points still disagree, do not begin the test. Notify the VT senior technician so that corrective action may be initiated.

7.15   (Site Operator) When the TAP program is activated and the correct test number and vehicle ID number(s) have been entered in TAP for each dyno, place a check mark in the proper space on Form 707-01.

7.16   (Site Operator) If the LCS-TAP program is not available and the test data are to be collected manually, monitor the test cell ambient temperature and dew point using the strip chart recorder on the "Ambient Monitoring System" stand located in the test cell.

   7.16.1   Place the "Ambient Temperature" label on the chart paper and record the following information:

   Date

   Equipment Tracking Number (ET #)

   Chart Speed

   Dynamometer Number (Dyno #)

   Test Number (Test #)

   Vehicle Identification Number (Vehicle ID #)

   Technician Identification Number (Tech ID #)

   7.16.2   Set the chart speed to 10 centimeters (cm) per hour (hr).

   If the chart recorder does not have this speed available, set the speed as close as possible to 10 cm/hr.

   7.16.3   Check that the power is on for the analyzer and the "Ambient Monitoring System" chart recorders. Chart recorder power is routinely left on.

   When the strip chart recorder power has been off for any period of time, an equal period of time with the recorder power on is required for instrument warmup, e.g., 1-minute power off requires a 1-minute warmup, and so on, up to 1 hour maximum warmup.

   If you are unable to determine how long the recorder has been off, you must allow the recorder to warm up for a minimum of 1 hour. If you turn on a recorder, you must record the power on time on the chart paper.

7.16.4 Verify that the strip chart recorder's mechanical zeros are set to zero, and adjust if necessary.

7.17 (Site Operator) If TAP is not used, place the "Analyzer Data" label on the strip chart and record the required information:

Date

Dyno #

Test #

Vehicle ID #

Tech (Driver) ID #

7.18 (Site Operator) When Steps 7.3 and 7.6 through 7.17 have been completed and verified, place a check mark on Form 707-01 in the "Verify the following" space.

7.19 (Site Operator) On Form 708-01, record the following:

Driver ID .... Row C, Columns 14-18

Dyno Site .... Row C, Columns 24-27

Odometer .... Row C, Columns 37-42

Tire Pressure .... Row C, Columns 43-46

CVS Unit .... Row C, Columns 61-63

7.20 VDA System: To operate the VDA, you may need to view MacAcademy's "Basic Macintosh" videotape, which is a self-taught course explaining the operation of the Macintosh personal computer. See TP 703, Attachment F for more details on VDA operation.

8. Test Procedure

Form 707-01 provides a checklist to verify that each step on the form is completed, thereby ensuring orderly execution of the test procedure. For tests using the twin-roll hydrokinetic dynamometer, follow the instructions in Sections 100, 300, 400, and 600. For tests using the 48" single-roll electric dynamometer, follow the instructions in Sections 200, 300, 500, and 600.

Unless otherwise indicated, the driver is responsible for ensuring that the following steps are performed.

100   Twin-roll dyno setup

101   For the FTP, do not start the engine, place the drive wheels of the vehicle on the dynamometer rolls, and leave the vehicle in neutral.

For the HFET, drive the vehicle onto the dynamometer, place the drive wheels on the dynamometer rolls, and leave the vehicle in neutral.

102   When the vehicle enters the test cell, label the ambient temperature strip chart or TAP printout "On Dyno #X." The "X" is the dyno number, such as 1, 2, 3, etc."

103   Check and, if necessary, adjust the drive tire pressure to 45 psi, unless otherwise specified.

104   (Driver and Site Operator) Verify that the dynamometer inertia weight (equivalent test weight) is correctly set to the VSR value specified for the test vehicle.

105   Verify that the indicated horsepower (IHp) is set correctly. The indicated horsepower vs. actual horsepower (AHp) chart is posted on each dyno.

If the required AHp is not listed, calculate the IHp using the coefficient for the specific inertia weight on the chart. Use the "ASTM Rounding Off Procedure" to determine the correct horsepower to the tenth place. The coefficient will be different for each dyno; therefore, be sure to use the chart posted on the dyno.

106   Press the dyno "Index" light button, located on the Road Load Power Control (RLPC) box.

107   While the light is flashing, select the indicated horsepower using the thumbwheels on the dyno RLPC box. Ensure that the horsepower is set during the flashing light sequence; if it is not set during this period, press the "Index" light button again and enter the horsepower while the light is flashing.

If the light either fails to flash or will not stop flashing, notify C&M.

If it is not set correctly, press the dyno "Index" light button. While the light is flashing, select the indicated horsepower using the thumbwheels on the dyno RLPC box.

108   Release the roll brake when the dyno "Index" light stops flashing.

109   Ensure that the front/rear roll switch is in the "Rear Roll" position.

110   Center the vehicle drive wheels on the dyno rolls by turning the rolls with your foot until the vehicle is centered, and ensure that the correct inertia weights are engaged. Leave the vehicle in neutral. Ensure that the drive tires have adequate side clearance from the dynamometer frame.

        If the vehicle fails to center properly, notify the VT senior technician.

111   Connect the vehicle restraint system. The rear-drive system must have the slack removed and allow approximately 4 inches of play at the center of the cable or strap. The front-drive system must have the slack removed and allow approximately 2 inches of play at the center of the cable or strap.

        Do not overtighten the cable.

112   Connect the vehicle exhaust to the CVS and ensure that the dump hose is inserted into the floor exhaust scrubber and is not crimped.

113   Open the hood or engine compartment cover.

114   Position the cooling fan(s) within 12 inches of the vehicle (unless otherwise specified) and turn the power to the cooling fan(s) on. On Form 707-01, use the drawing of the vehicle and indicate the fan placement.

115   Place the wheel chocks in front of the non-drive wheels.

        If airplane style chocks are used, position each around a non-drive wheel of the vehicle and tighten them until they fit snugly around the tire.

116   Check that all accessory switches on the test vehicle are in the "Off" position prior to starting the engine.

117   Ensure that the correct starting procedures are located in the vehicle. If they are not, contact the VT senior technician.

118   Go to Step 300.

200   **48-Inch Single-Roll Electric Dyno Setup**

Note: Cradle and centering functions can be controlled by either the CTM250G microterminal at the driver's station or the RTM-200 computer keyboard in the site control room.

201   Retract the roll covers of the 48" single-roll electric dynamometer by pressing the "COVER ON/OFF" button on the CTM250G Driver's Station.

Personnel in the test cell should avoid close proximity to the vehicle when the 48" single-roll electric dynamometer roll cradle is raised or lowered.

202   Raise the roll cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G microterminal.

203   To engage the dyno contactor, press <START> on the CDC-900 cabinet or <START> on the remote driver's station pendant.

204   For the FTP, do not start the engine, place the drive wheels of the vehicle on the dynamometer roll, and leave the vehicle in neutral.

For the HFET, drive the vehicle onto the dynamometer, place the drive wheels on the dynamometer roll, and leave the vehicle in neutral.

205   Label the TAP printout or ambient temperature strip chart "On Dyno #X." The "X" is the dyno number, such as 1, 2, 3, etc.

206   Center the vehicle by pressing the CTM250G microterminal "CENTERING START/STOP" button.

207   In response to the prompt on the CTM250G microterminal screen, use the CTM250G driver's station keyboard to enter the value specified for the VSR vehicle weight (equivalent test weight).

The "CENTERING START/STOP" button on the CTM250G microterminal will remain lit, and the RTM-200 computer screen will show acceleration to a speed of 1 mph while the rolls are turning.

208   Position one of the wheel chock assemblies around a non-drive wheel of the vehicle. Insert the linkage bar locking nuts in the tee-slot tracks.

209   Slide the moveable wheel chock so that both parts of the chock assembly fit against the tire and draw the chocks firmly together against the tire by turning the handle clockwise on the threaded rod.

210   Secure the locking nuts which bolt the free end of the linkage bars to the tee-slot tracks.

211   Repeat Steps 208 through 210 to position the other wheel chock assembly against the other non-drive wheel of the vehicle.

212   Visually ensure that the front and rear cradle rolls are turning at about the same speed and the vehicle drive wheels are positioned approximately at the roll surface crown.

    If not, adjust the wheel chock positions until the rolls appear to be turning at the same speed.

213   Stop the rolls by pressing the CTM250G "CENTERING START/STOP" button.

214   Lower the cradle by pressing the CTM250G "CRADLE UP/DOWN" button.

215   Cover the exposed portion of the rolls by pressing the CTM250G "COVER ON/OFF" button.

216   Check and, if necessary, adjust the drive tires to the manufacturer's recommended pressure per the VSR, unless otherwise specified.

217   Use the RTM-200 computer keyboard for this step through Step 226. Select "ROAD SIMULATION" from the "DYNAMOMETER MAIN MENU" screen.

218   Ensure that the "BRAKE" is "OFF" and the "CRADLE" is "DOWN," and observe that the rolls are not moving.

219   Obtain the "VEHICLE SIMULATION PARAMETERS" screen by pressing <F2>.

220   Select the appropriate vehicle ID by pressing <PgUp> or <PgDn>. The vehicle ID will be shown next to "Class" on the screen.

221   Recall or enter the correct test number, inertia (ETW), and A, B, and C coefficients. The A, B, and C coefficients are in the comments section of the VSR.

222   Look at the RTM-200 computer screen and ensure that the "Augmented Braking" is "OFF," unless indicated otherwise on the VSR. Use the right or left arrow key to turn "Augmented Braking" either "ON" or "OFF."

223   Use the right or left arrow key to select "NO" for "Grade" simulation.

224   To return to the "SETUP MODE" of the "ROAD SIMULATION" screen, press <Esc>.

225   If no warning messages are displayed, press <F1>, followed by <Esc> to return to the "RUN MODE."

226   If warning messages are displayed, address the warning (see "Horiba Dynamometer Operations Manual"), then press <F1>, followed by <Esc> to return to the "RUN MODE."

227   Connect the vehicle exhaust to the CVS and ensure that the dump hose is inserted into the floor exhaust scrubber and is not crimped.

228   Open the vehicle hood or engine compartment cover.

229   Position the cooling fan(s) within 12 inches of the vehicle (unless otherwise specified) and turn the power to the cooling fan(s) on. On Form 707-01, use the drawing of the vehicle and indicate the fan placement.

230   Ensure that all accessory switches on the test vehicle are in the "Off" position prior to starting the engine. If not, turn them off.

231   Ensure that the correct starting procedures are located in the vehicle. If they are not, contact the VT senior technician.

300   Video Driver's Aid (VDA) System

301   (Site Operator) On Form 707-01, check off each item listed in the "Test Vehicle Dynamometer Hookup," "Twin-Roll Hydrokinetic Dynamometer" and, if applicable, the "48" Single-Roll Electric Dynamometer" sections. This will ensure that the equipment and the test vehicle have been properly set up for testing and that all preparatory steps have been completed by the driver.

        (Driver) Verify that the correct VDA test type and number have been selected.

302   Under the "Test" menu, position the mouse pointer on "Test" and press and hold down the mouse button, opening the "Test menu." Continue to hold down the mouse button, pull the mouse toward you, and position the pointer on "Setup for Driving;" then release the mouse button to select it. See Figure 1 for FTP and 1A for HFET.
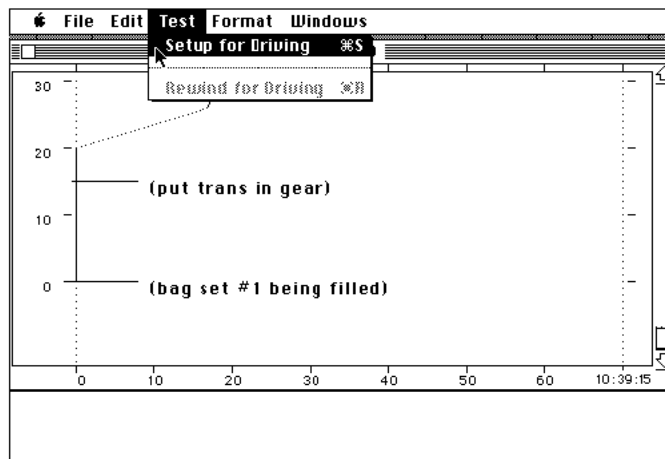
Figure 1
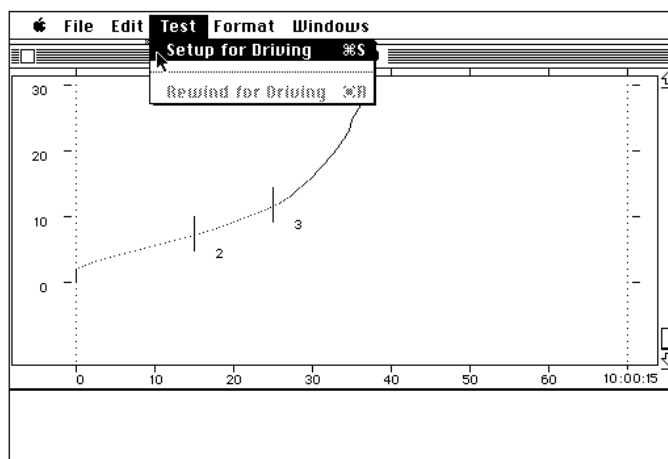
Figure 1A

303   (Site Operator) CVS Operation - Turn on the CVS blower and cooling fan(s) just prior to starting the test. After ensuring that the CVS blower is in the "ON" position, turn on the CVS sample pumps. Ensure that the indicators on the VDA screen for "Blower" and "Pump" are on. See Figure 2 for the FTP and 2A for the HFET. Turn the CVS test mode selector switch to "Reset" and back to "Vehicle Test" to reset the VDA and zero the CVS V-mix counters.

Figure 2

Figure 2A

304   Before starting the engine, ensure that the "Ready" indicator on the bottom of the VDA screen is on. See Figure 3 for the FTP and 3A for the HFET. If the test type is HFET, go to Step 339
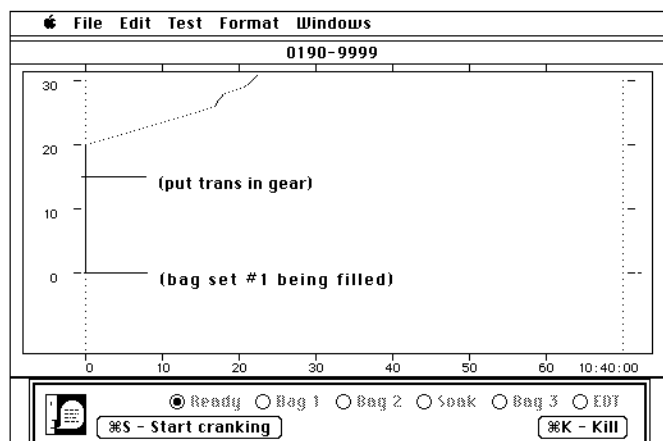
Figure 3

Figure 3A

305   Simultaneously start the test vehicle's engine, according to the manufacturer's recommended starting procedures, and press <Command S>. If the engine starts and continue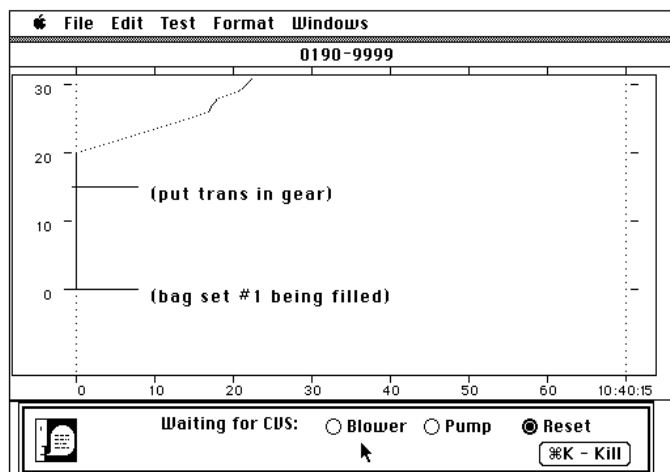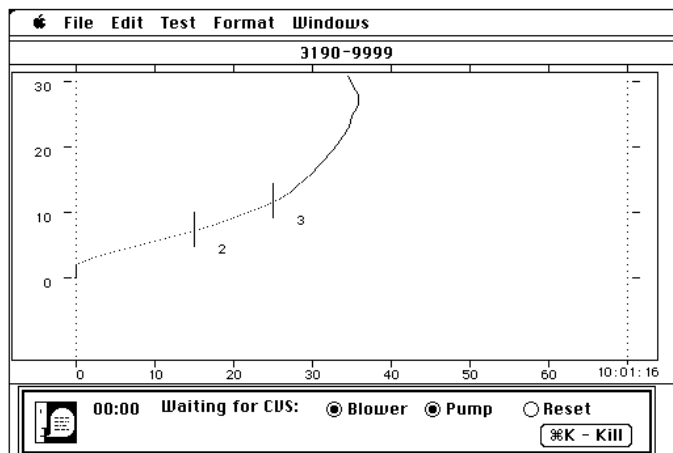s to run, go to Step 307. If the vehicle does not start after 10 seconds of cranking, the cranking shall cease and the reason for failure to start shall be determined. Select the "Hold cranking > 10 sec." button at the bottom of the screen by pressing <Command-Space Bar>. See Figure 4
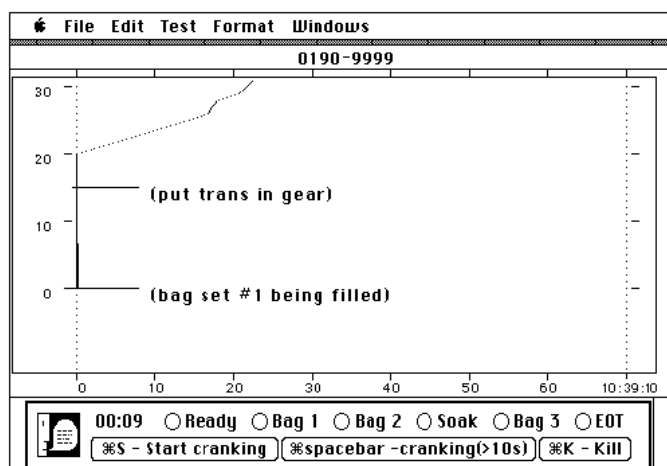
Figure 4

The "Hold sampling" button will now appear on the bottom of the screen. See Figure 5. The CVS sample selector valves shall be turned off by pressing <Command-Space Bar>.
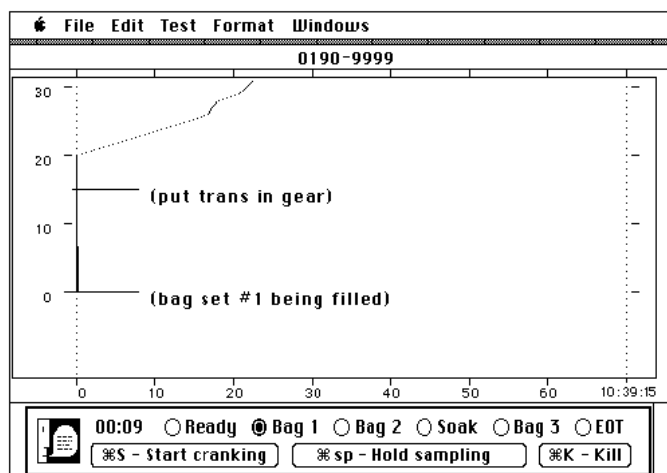
Figure 5

In addition, the CVS compressor (blower) and cooling fan(s) shall be turned off during this diagnostic period. V-Mix counts are not zeroed or reset prior to attempting to restart the vehicle. After an unsuccessful start attempt, notify the VT senior technician, the manufacturer's representative (certification vehicles), or the appropriate EPA Task Officer (in-use vehicles) for further instructions.

If the failure to start is determined to be a vehicle malfunction, corrective action of less than 30 minutes duration may be taken by the manufacturer's representative if accompanied by Certification personnel or the appropriate Task Officer.

If the failure to start is determined to be an operational error, the test will be void and the vehicle will be rescheduled for testing. Complete Form 902-01, obtain all approved signatures, and file with the data processor.

If the test vehicle is in the Recall program, start the engine according to the technical directive.

306   Second start attempt: When you are ready to attempt to start the vehicle again, make sure that the CVS blower and sample pumps are on. Verify that the VDA "Ready" indicator is on.

If necessary, reset the VDA Control dialog box by pressing <Command-S> to select the "Try again" button. See Figure 6.
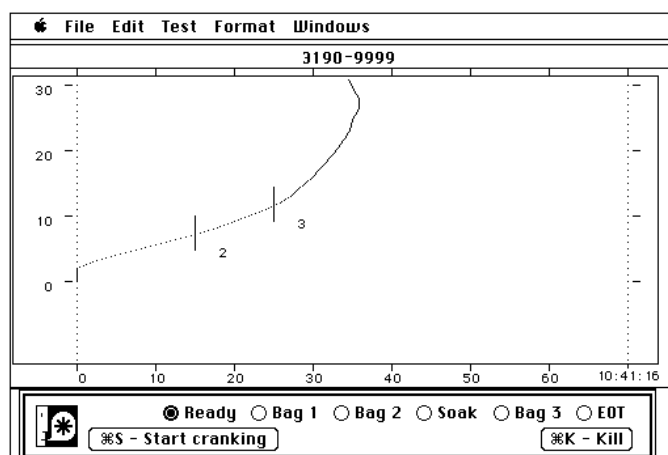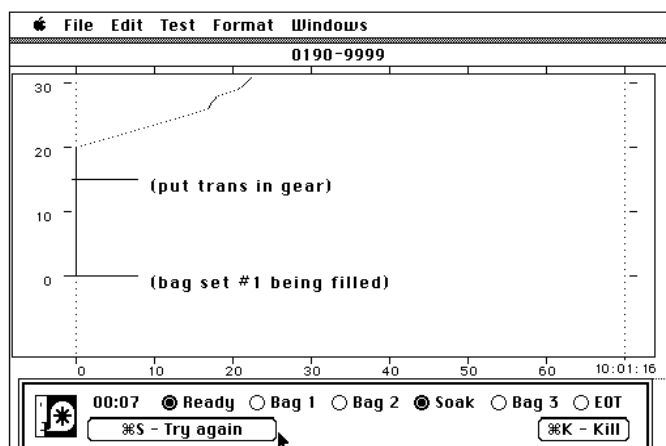

Figure 6

Simultaneously start the test vehicle's engine, according to the manufacturer's recommended starting procedures, and press <Command S>. If the engine starts and continues to run, go to Step 307.

If a second start is attempted and the vehicle does not start within 10 seconds of cranking, pause for 10 seconds and crank again. A total of not more than three 10-second cranks, with 10-second pauses between each crank, should be attempted. After three unsuccessful start attempts, notify the VT senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use Vehicles) for further instructions.

If the test vehicle is in the Recall program, start the engine according to the technical directive.

307   Press <Command S> to start the VDA trace scrolling. The crank time will be
        displayed on the left side of the dialog box. See Figure 7.

        If the key has not been turned to the start position and you need to stop,
        simultaneously press the <Command> key and the space bar to stop scrolling.
        Select "Re-set up Test" in the control dialog box. To reset the trace with the mouse
        pointer, point the arrow on the "Re-set up Test" box and click the mouse one time.
        Return to Step 302.
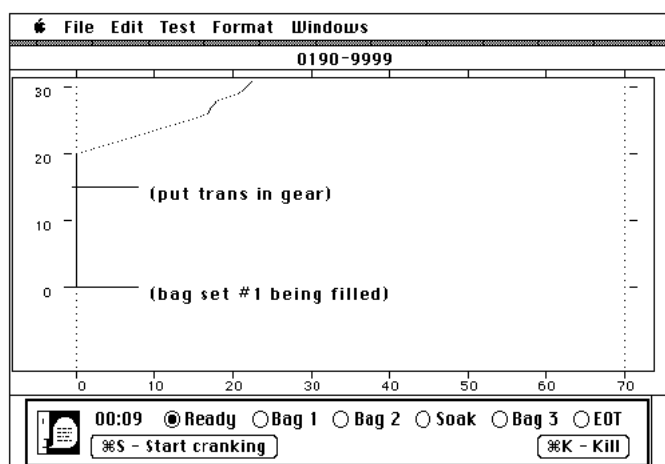
Figure 7

308   Verify that the "Bag 1" indicator is on.

309   If the engine false starts (i.e., does not continue to run when the ignition switch is
        returned to the "ON" position following the cranking), repeat the recommended
        starting procedure, pausing for 10 seconds before cranking for 10 seconds, unless
        otherwise recommended by the manufacturer or appropriate Task Officer.
        Complete Form 902-01, obtain all approved signatures, and file with the data
        processor.

If the vehicle's engine false starts three times, cease cranking and notify the VT senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use Vehicles) for further instructions.

If the vehicle cannot be restarted before the initial acceleration, stop the VDA trace from scrolling by pressing <Command-Space Bar>. See Figure 8.
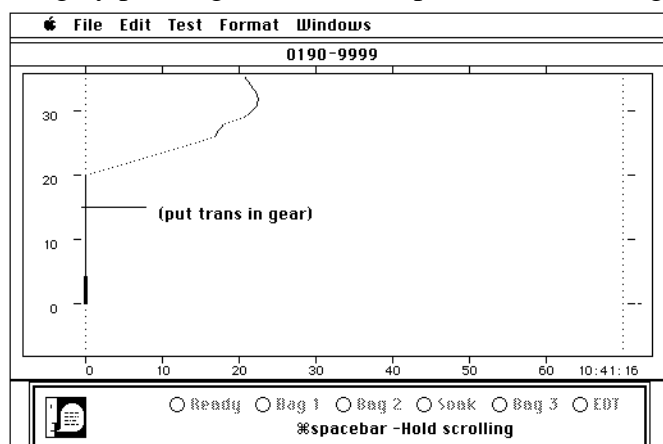
Figure 8

310   If the engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen.
See Figure 9.
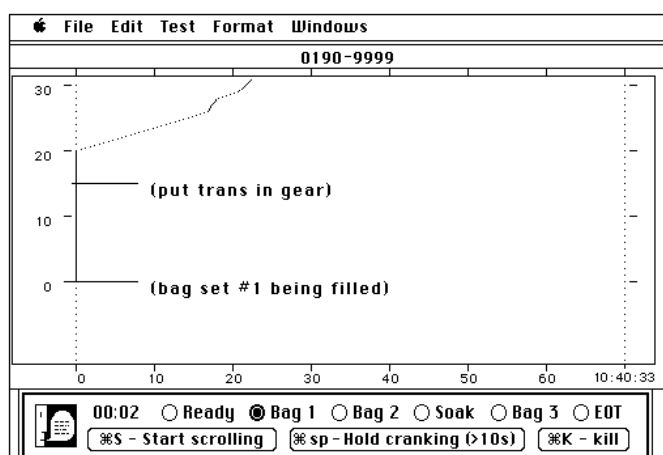
Figure 9

311   If you need to stop, select the Kill button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test Menu." Position the pointer on the "Rewind" menu item and release the mouse button to select it.

        If you did rewind, go to Step 302, otherwise continue.

312   (Site Operator) If the LCS-TAP program is not available and the test data are being collected manually, record the test start time on Form 708-01. Use military time and enter the data under "Test Key Start," Card H, Columns 76-79.

313   Operate the test vehicle as described in CFR 86.137. See Attachment F, "UDDS Specifications" for a list of driving techniques to be followed during the vehicle preconditioning. Before driving the test vehicle on the 48" single-roll electric dynamometer, ensure that it is in the "RUN MODE" and the contactor has been engaged.

        If a condition occurs at any time during the driving of the Urban Dynamometer Driving Schedule (UDDS) that requires the driver to add a comment, press <~>. This will flag the data for entry of a comment at a time convenient for the driver.

314   If the vehicle is driven at WOT, indicate all places where this occurs on the driver's trace. See Section 600, Editing Driving Events (Entering Comments), for instructions.

315   (Site Operator) Verify that the sample flow rates for bag one are between 13-20 scfh and place a check mark on Form 707-01.

316   (Site Operator) At the 505-second point of the UDDS, the VDA will automatically switch to the second set of sample bags. See Figure 10.

Figure 10

317   (Site Operator) If the test is being run manually without LCS-TAP, record the roll revolution and CVS V-mix counts for the first set of sample bags on EOD Form 708-01.

        If the difference of the TAP vs. meter reading of either the roll revolution or V-mix counts are greater than 15 counts, write the meter readings on the TAP printout and notify C&M.

        If LCS flags the roll revolution or V-mix counts, enter the meter readings on the TAP printout and notify C&M. Obtain the bag fill time from the "VDA Summary Report" at the end of the test.

318   (Site Operator) Verify that the sample flow rates for bag two are between 13-20 scfh and place a check mark on Form 707-01.

319   (Site Operator) As soon as possible following the completion of sample collection of the first set of bags, measure the concentration of hydrocarbons, oxides of nitrogen, carbon dioxide, and carbon monoxide (and methane, when requested) in the exhaust and background samples (see TP 708).

        There is a 20-minute limit for analysis of the sample bag. There is no limit for analysis of background bags.

320   Two seconds after the end of the last deceleration of the EPA Urban Dynamometer Driving Cycle (the 1369-second point on the driving schedule), turn the engine off.

321   When the engine stops running, press <Command-S>; 5 seconds later, the sampling will automatically stop and the soak indicator on the VDA screen will light. See Figure 11. Turn off the CFV-CVS blower. The VDA will automatically reset to the beginning of the next driving schedule.
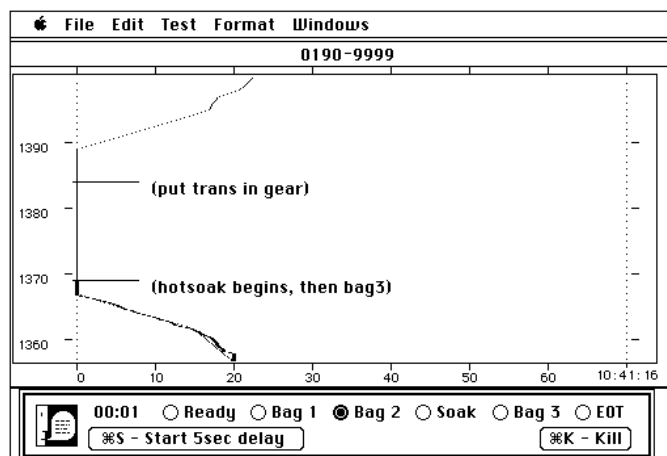
Figure 11

322   (Site Operator) When the driver turns off the CFV-CVS blower, immediately turn off the sample pumps and check that the CFV-CVS seconds counter has reset. Begin monitoring the soak time using the CFV-CVS seconds counter.

Verify that the vehicle hood is down and the power to the fan and CVS blower is turned off. Place a check mark on Form 707-01. The VDA also monitors soak time on its screen. See Figure 12. The total soak time must be 10 minutes, ±1 minute.


```
🍎  File  Edit  Test  Format  Windows
                    0190-9999

1390 ─
              (put trans in gear)
1380 ─

1370 ─        (hotsoak begins, then bag3)

1360 ─
       0   10   20   30   40   50   60   10:50:16

  📄  00:07   ○ Ready  ○ Bag 1  ○ Bag 2  ⦿ Soak  ○ Bag 3  ○ EOT
      Soak period is in-progress                      ⌘K – Kill
```
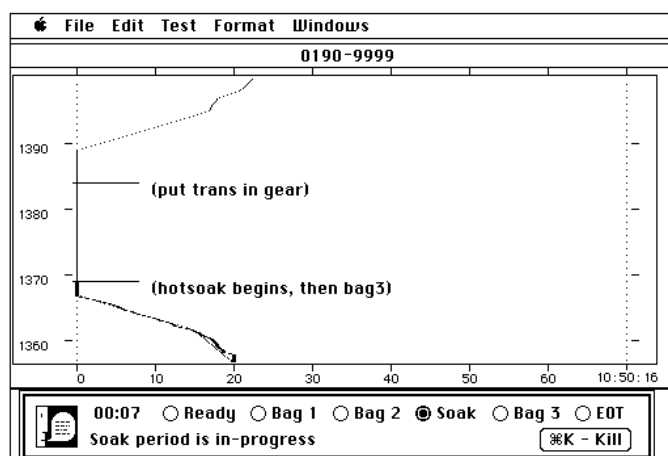
Figure 12

323   At the end of the sample period, immediately turn off the cooling fan(s) and close the engine compartment cover.

324   (Site Operator) If the difference of the TAP vs. meter reading of either the roll revolution or CVS V-mix counts is greater than 15 counts, write the meter readings on the TAP printout and notify the VT senior technician. If LCS flags the roll revolution or V-mix counts, enter the meter readings on the TAP printout.
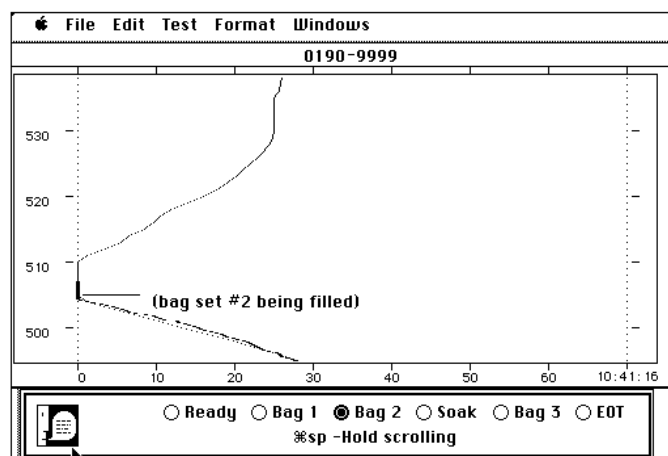
If the test is being run manually without LCS-TAP, record the roll revolution and CVS V-mix counts for the second set of sample bags on Form 708-01. Obtain the bag fill time from the "VDA Summary Report" at the end of the test.

325　(Site Operator) As soon as possible following the completion of sample collection of the second set of bags, measure the concentration of hydrocarbons, oxides of nitrogen, carbon dioxide, and carbon monoxide (and methane, when requested) in the exhaust and background samples (see TP 708).

326　(Site Operator) For Fuel Economy Vehicles only, monitor the cell temperature during the 10-minute soak, particularly for the first 4 minutes, to assure that it does not exceed the tolerance of 68-86 °F. It is desirable to maintain the set point temperature of 75 °F.

　　　If the temperature drops below 72 °F, the reheat thermostat on the test cell air handling unit should be adjusted. If corrective action fails, notify the VT senior technician.

327　(Site Operator and Driver) When the VDA, LCS, or CVS indicates that 9 minutes have elapsed, alert the driver. See Figure 13. At this time, the driver can open the vehicle's engine compartment cover. Turn on the CFV-CVS blower, the sample pumps, and the cooling fan(s).

328　(Site Operator) Verify that the CFV-CVS blower, the sample pumps, and the cooling fan(s) are operating and place a check mark on Form 707-01.
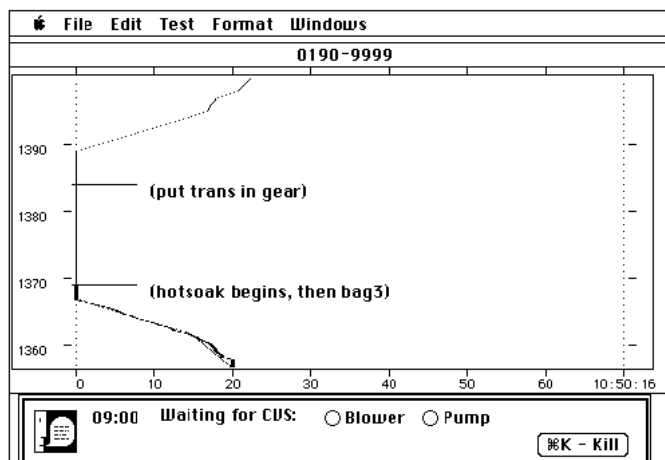
Figure 13

329   If the required 10-minute soak (±1 minute) has been completed and the "Ready"
        indicator on the VDA screen is on, start the test vehicle's engine according to the
        manufacturer's recommended hot-start procedures and follow the instructions in the
        control dialog box at the bottom of the screen.

330   To start sampling, press <Command-S> and ensure that the "Bag 3" indicator is on;
        then crank the engine. See Figure 14.

        If the vehicle does not start within 10 seconds, see Steps 307 through 323 for
        details. The crank time will be displayed on the left side of the control dialog box.
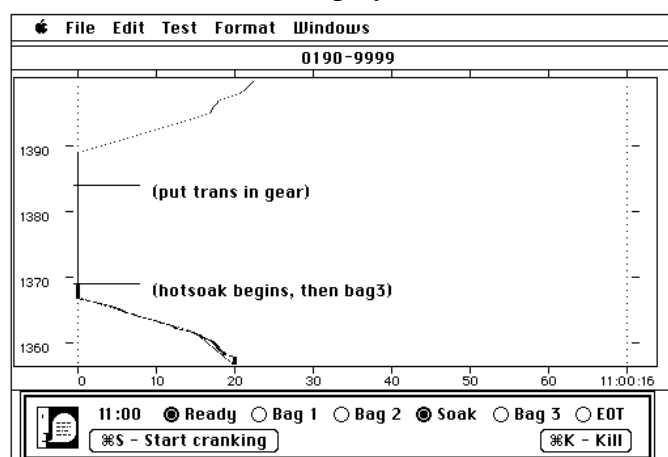
Figure 14

331   (Site Operator) Verify that the sample flow rates for bag three are between
        13-20 scfh and place a check mark on Form 707-01.

332   If the vehicle engine starts and continues to run, start the VDA trace scrolling by
        pressing <Command-S>, following the instructions at the bottom of the screen. See
        Figure 15.
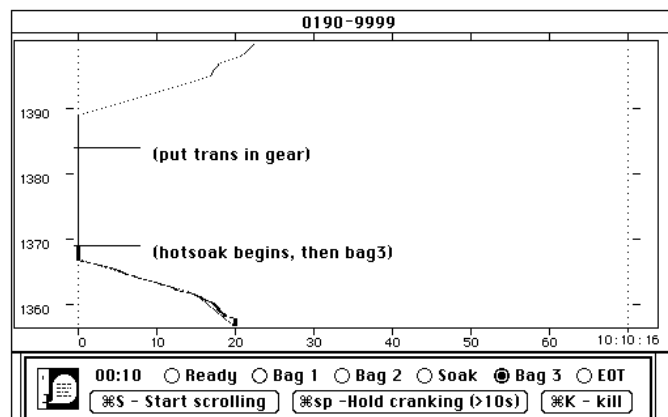
Figure 15

333   Drive the remainder of the test (hot-start transient phase, Bag 3) according to the UDDS.

334   At the 1874-second point of the UDDS, the VDA will automatically switch off the 3rd set of sample bags. See Figure 16. The "EOT" indicator will come on and the VDA will automatically save the test data.
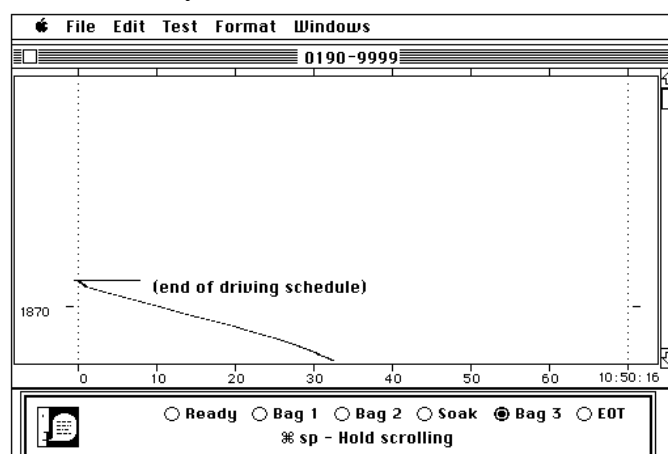
Figure 16

335   (Site Operator) If the difference of the TAP vs. meter reading of either the roll revolution or CVS V-mix counts is greater than 15 counts, write the meter readings on the TAP printout and notify the VT senior technician. If LCS flags the roll revolution or V-mix counts, enter the meter readings on the TAP printout.

If the test is being run manually without LCS-TAP, record the roll revolution and CVS V-mix counts for the 3rd set of sample bags on Form 708-01. Obtain the bag fill time from the VDA Summary Report at the end of the test.

336   (Site Operator) If the test is being run manually without LCS-TAP, check that the DVU roll revolution counts are within 8239.6 to 8574.4 counts for the 1st and 3rd bags and 8934 to 9298.8 counts for the 2nd bag. Any deviations from these limits should be reported to the VT senior technician.

337   (Site Operator) As soon as possible following completion of sample collection of the 3rd set of bags, measure the concentration of hydrocarbons, oxides of nitrogen, carbon dioxide, and carbon monoxide (and methane, when requested) in the exhaust and background samples (see TP 708).

338   If the vehicle requires a Sealed Housing for Evaporative Determination (SHED) hot-soak test, leave the engine running, apply the brakes, and remain seated while the vehicle is being disconnected from the dynamometer and sampling system.

If a HFET is required, go to Step 339. If not, go to Section 400 for vehicle removal from the twin-roll dyno or go to Section 500 for details on vehicle removal from the electric dyno.

339   The following steps are for the HFET. Start the test vehicle's engine according to the manufacturer's recommended starting procedures. If the test vehicle is in the Recall program, start the engine according to the technical directive. Follow the instructions in the control dialogue box at the bottom of the screen.

340   If the vehicle engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen.

If you need to stop, select the "Kill" button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test" Menu. Position the pointer on the "Rewind" menu item and release the mouse button to select it and go to Step 302.

341   To start scrolling, simultaneously press <Command-S> and crank the engine. The crank time will be displayed on the left side of the control dialog box. See Figure 17.
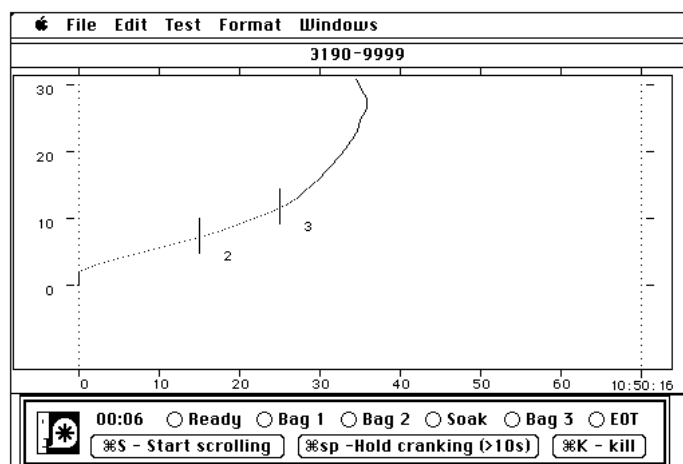
Figure 17

If the key has not been turned to the start position and you need to stop, select the "Kill" button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test" Menu. Position the pointer on the "Rewind" menu item and release the mouse button to select it and go to Step 302.

342   If the vehicle does not start after 10 seconds of cranking, the cranking shall cease and the reason for failure to start shall be determined. Select the "Hold cranking > 10 sec." button at the bottom of the screen by pressing <Command-Space Bar>. See Figure 18
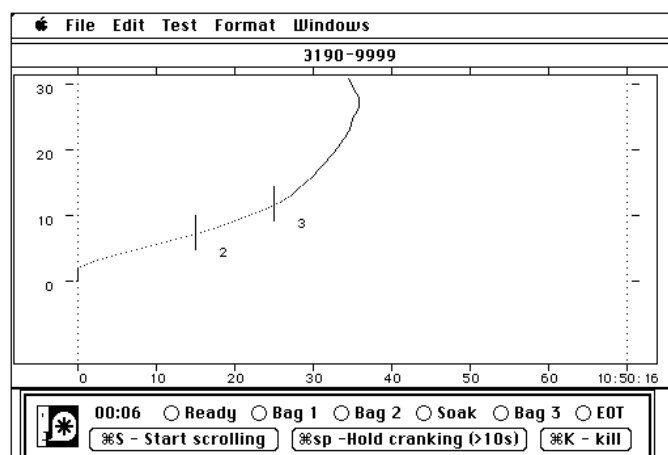
Figure 18

343   Second start attempt:

When ready to attempt to start the vehicle again, make sure that the CVS blower and sample pumps are on.

Ensure that the "Ready "indicator on the VDA screen is on. Reset the VDA Control dialog box by pressing <Command-S> to select the "Try again" button.

If a second start is attempted and the vehicle does not start within 10 seconds of cranking, pause for 10 seconds and crank again.

A total of not more than three 10-second cranks, with 10-second pauses between each crank, should be attempted.

After three unsuccessful start attempts, notify the VT senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use vehicles) for further instructions.

344   Start the test vehicle's engine according to the manufacturer's recommended starting procedures. If the test vehicle is in the Recall program, start the engine according to the technical directive. Follow the instructions in the control dialogue box at the bottom of the screen. To start scrolling, simultaneously press <Command-S> and crank the engine. See Figure 19.
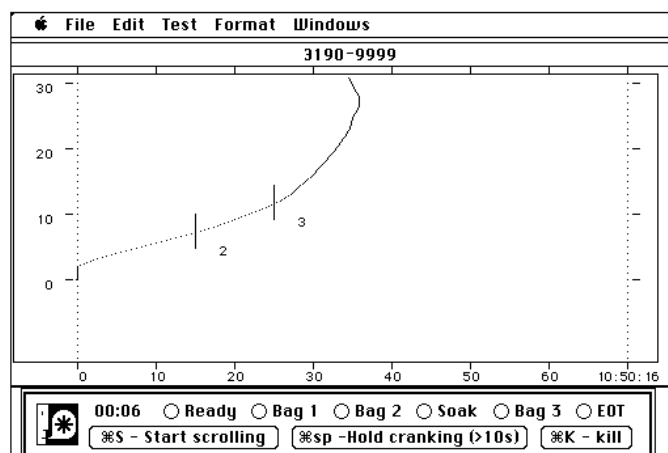
Figure 19

345   If the engine false starts (i.e., does not continue to run when the ignition switch is returned to the "On" position following the cranking), repeat the recommended starting procedure, pausing for 10 seconds before cranking for 10 seconds, unless otherwise recommended by the manufacturer or appropriate Task Officer.

If the vehicle's engine false starts three times, cease cranking and follow the procedure for a "no start" condition.

If the vehicle cannot be restarted before the initial acceleration, stop the trace from scrolling by pressing <Command-Space Bar>.

346   If the LCS-TAP program is not available and the test is being collected manually, record the test start time on Form 708-01.

347   Operate the test vehicle for one preconditioning EPA Highway Fuel Economy Driving Schedule (HFEDS). See TP 703 for driving techniques to be followed during the vehicle preconditioning.

Note: Before driving the test vehicle on the 48" single-roll electric dynamometer, ensure that it is in the "RUN MODE" and the contactor has been engaged.

If at any time during the driving of the HFEDS a condition occurs that requires the driver to add a comment, press <~>. This will flag the data for entry of a comment at a time convenient for the driver.

348   If the vehicle is driven at wide open throttle (WOT), indicate all places where this occurs on the VDA trace. See Section 600, Editing Driving Events for instructions.

349   At the 780-second point of the HFET, 2 seconds before the beginning of the first acceleration, the VDA will automatically start sampling. See Figure 20. Operate the test vehicle for one EPA Highway Fuel Economy Driving Schedule (HFEDS).

If the vehicle stalls during the sample collection of the HFEDS, the test is void.
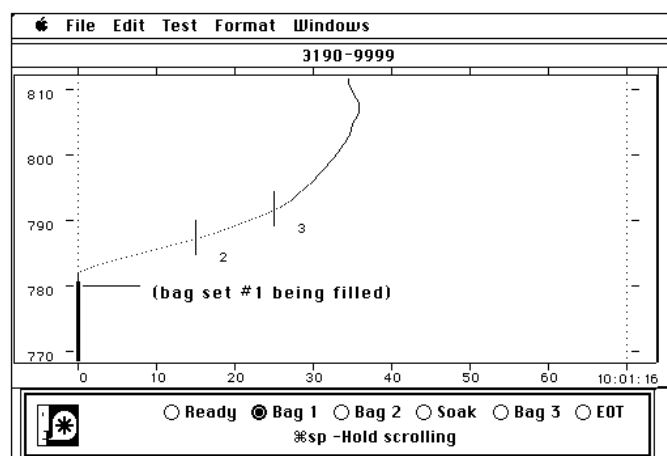
Figure 20

350   If problems occur before the end of the test (1545 seconds), the HFEDS may be stopped by selecting <Command-Space Bar> and corrective action taken. The sample bags must be evacuated, purged, and evacuated again and the roll revolution counter must be reset.

351   If the test is to be set up again prior to the 780 second point of the trace, and the CVS has not been sampling, purging and evacuating are not required. For both conditions the TAP test file must be saved as "Bad" and the test number entered again.

352   The previous test data have not been saved and the HFEDS may then be restarted. To restart the VDA video strip chart at the beginning, position the pointer on the "Re-set up Test" button in the control dialog box and click on it. See Figure 21.

When you are ready to restart the HFEDS, return to Step 302. If the engine is running, do not attempt to start it again. The final VDA Summary Report will show that the test had been set up again, thus documenting the corrective action taken.

Figure 21

353   The test number may be reused. The bags must be evacuated, purged, and evacuated again unless another set of bags is used.

354   (Site Operator) During the sample collection of the test, check the CVS sample flow rate to ensure that it is within 13-20 scfh. Place a check mark in the area provided to indicate it is within this range. If it is not within the range, notify C&M.

355   At the 1545-second point of the HFEDS, 2 seconds after the end of the deceleration to zero, the VDA will automatically switch off the sample bag. See Figure 22. The "EOT" indicator will come on. The vehicle engine must be running.

(Site Operator) Turn off the sample pumps. Go to Step 357.
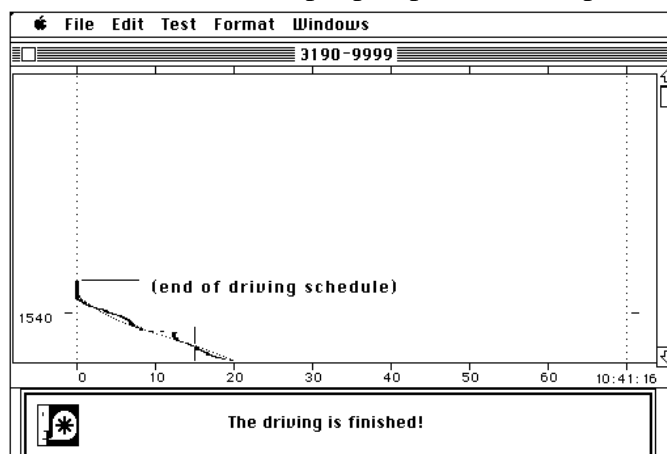
Figure 22

356   Within 1 minute following completion of the HFEDS, the driver must perform a Quick Check Coastdown, if required (TP 712). When the Quick Check Coastdown is completed, turn off the CVS blower.

Go to Section 400 for vehicle removal from the twin-roll dyno or go to Section 500 for details on vehicle removal from the electric dyno.

357   (Site Operator) If the difference of the TAP vs. meter reading of either the roll revolution or CVS V-mix counts is greater than 15 counts, write the meter readings on the TAP printout and notify the VT senior technician. If LCS flags the roll revolution or V-mix counts, enter the meter readings on the TAP printout.

If the test is being run manually without LCS-TAP, record the roll revolution and CVS V-mix counts for the sample bag on Form 708-01. Obtain the bag fill time from the VDA Summary Report at the end of the test.

358   (Site Operator) If the test is being run manually without LCS-TAP, check that the DVU roll revolution counts are within 23644 to 24170 counts. Any deviations from these limits should be reported to the VT senior technician.

359   (Site Operator) As soon as possible following completion of sample collection of the bag, measure the concentration of hydrocarbons, oxides of nitrogen, carbon dioxide, and carbon monoxide (and methane, when requested) in the exhaust and background samples (see TP 708).

400   Vehicle Removal - Twin-Roll Dyno

401   Disconnect the restraint system and remove the wheel chocks from the vehicle.

402   Engage the dynamometer roll brake by pressing the red button on the dyno control panel.

403   Close the vehicle engine compartment cover so that it is fully latched and move the cooling fan(s) out of the way. If insufficient time is available, another technician should assist.

404   Drive the vehicle off the dyno at the minimum necessary throttle. If a SHED hot soak is required drive the vehicle to the entrance of the evaporative SHED as soon as it is disconnected (see TP 709).

405   Go to Step 600.

500 **Vehicle Removal - 48" single-roll electric dyno**

501 Print the "DYNAMOMETER REPORT" by pressing <Alt> and <P> on the RTM-200 computer keyboard. Verify that the A, B, and C coefficients on the "DYNAMOMETER REPORT" correspond with the data on the VSR. If there are omissions, inconsistencies, or errors, notify a VT senior technician.

If there are no omissions, inconsistencies, or errors, enter your technician ID number and the date on the "DYNAMOMETER REPORT" and place it in the test packet.

502 Press <F1> on the RTM-200 computer keyboard. The message "END THIS TEST NOW? Y/N" will appear on the screen. Selecting "Y" will save the data and return the controller to the "SETUP MODE."

503 On the RTM-200 monitor, verify that the positive and negative simulation errors are less than ±0.05%, respectively.

If the average positive simulation error equals or exceeds 0.05% or the average negative simulation error equals or exceeds -0.05%, notify C&M. The test is void and the vehicle must be rescheduled unless the project manager deems it acceptable for the purpose of this test. Complete Form 902-01.

504 Press the contactor "Stop" button on the CDC-900 cabinet.

505 Retract the roll covers by pressing the "COVER ON/OFF" button on the CTM250G microterminal.

506 Raise the cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G microterminal.

507 Disconnect the restraint system from the vehicle by loosening the linkage bar locking nuts. Disengage and remove the wheel chock assemblies from the non-drive tires. Slide the assemblies away from the tires and, if necessary, lift the assembly out of the tee-slot tracks to provide more clearance. When the cradle is lowered, the vehicle could move slightly along the roll. Since the movement can be up to one foot in either direction, personnel in the test cell should avoid close proximity to the vehicle when the cradle is lowered.

508 Lower the cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G microterminal.

509 Apply the roll brake by pressing the "BRAKE ON/OFF" button on the CTM250G microterminal.

510   Close the vehicle engine compartment cover so that it is fully latched and move the cooling fan(s) out of the way. If there is insufficient time available, another technician should assist.

511   (Site Operator) When the vehicle has been removed from the dyno, close the roll covers by pressing the "COVER ON/OFF" button on the CTM250G microterminal.

512   Drive the vehicle off the dyno at the minimum necessary throttle. If a SHED hot soak is required drive the vehicle to the entrance of the evaporative SHED as soon as it is disconnected (see TP 709).

513   Go to Step 600.

600   Editing Driving Events

601   To edit the "Summary Report," position the mouse pointer on the scroll arrow and hold down the mouse button until the "Out-of-Tolerance Events" are in view. See TP 703, Attachment G for more details. Out-of-tolerance events must be documented**.**

602   When editing is completed, the VDA will return to "Daily Tests Window."

603   (Site Operator) Save LCS-TAP data, ensure that all three sets of exhaust and background sample bags have been analyzed and that all TAP flags have been properly addressed (see the TAP Flag Directory).

604   (Site Operator) Press <BREAK>. The "TSP OPCOM Y PROD" banner message should appear. Enter the "Save" command (Type "S"), dynamometer number, vehicle ID, and the site operator's 5-digit ID number, following this format: S (space) D00?,NNNNN. Press <RETURN>.

        TAP prints the test number, site number, dyno number, vehicle ID, and the Preliminary Test Data Summary. Remove the TAP printout from the Decwriter terminal and review the TAP data for completeness.

        If LCS-TAP was not used for sample collection, remove the "Ambient Monitoring System" strip chart trace from the recorder and check that the ambient and dew-point temperatures remained within tolerances.

605   The site operator enters their EPA ID number and date in the appropriate space on Form 707-01.

9.   Data Input

9.1   The following information will automatically appear in the VDA vehicle test information dialog box when the test is selected:

Test number

Vehicle manufacturer (Mfr.)

Vehicle identification number (Veh ID)

Test Type

Test Procedure (Test Proc)

Test Schedule (Test Sch)

Shift Schedule (Shift Sch)

Drive Schedule (Drive Sch)

9.2   The driver enters the following information on the VDA test information dialog box:

Equivalent Test Weight (Eq Test Wgt)

Indicated dyno horsepower (Ind HP) for twin-roll hydrokinetic dynamometer, or the letters "COEF" for the 48" single-roll electric dynamometer

Driver Identification Number (Driver ID)

Dynamometer Site Number (Dyno Site)

9.3   The driver enters comments on the VDA driver's trace, for example WOT, stall, stumble, hesitation, trace spikes, and late or missed shifts.

9.4   The site operator enters the following information on Form 708-01:

ACTUAL INERTIA SETTING .... Row C, Columns 28-32

INDICATED DYNO HP .... Row C, Columns 33-36 (Twin Roll Only)

ODOMETER .... Row C, Columns 37-42

TIRE PRESSURE .... Row C, Columns 43-46

CVS UNIT .... Row C, Columns 61-63

FUEL CONTAINER ID .... Row H, Columns 40-45

9.5   TAP flags are addressed per the TAP Flags directory

9.6   The site operator enters the following information on TAP:

> Dynamometer #
>
> Test #
>
> Operator ID #

9.7   If TAP was not used, the driver places the "Ambient Temperature" label on the strip chart and enters the required information:

> Date
>
> Equipment Tracking Number (ET #)
>
> Chart Speed
>
> Dynamometer Number (Dyno #)
>
> Test Number (Test #)
>
> Vehicle Identification Number (Vehicle ID #)
>
> Technician Identification Number (Tech ID #)

9.8   On Form 707-01, the site operator records the "Vehicle ID" and the "Test Number" and selects "FTP" or "HFET" as a test type. They also record the last dyno usage and complete the checks each section. When completed they record their EPA ID number and the date.

9.9   If a vehicle is tested without a test number (i.e., as "DUMMY") the technician will enter the vehicle ID and dyno number in the comments of TAP.

9.10   If the 48" single-roll electric dynamometer is used, the driver enters the following on the "Vehicle Simulation Parameters" screen of the RTM-200 computer (if not already entered):

> Test number
>
> Vehicle ID number
>
> Inertia (ETW)
>
> A, B, and C coefficients

9.11   If the 48" single-roll electric dynamometer is used, the driver obtains a "DYNAMOMETER REPORT" printout including a plot of simulation error.

10. Data Analysis

The validation technician should be familiar with this procedure and should not have performed any of the preceding steps.

10.1 Review the VDA "Summary Report."

10.1.1 Ensure that the following information agrees with the VSR:

Vehicle manufacturer (Mfr.)

Vehicle identification number (Veh ID)

Version

Test Type

Test Procedure (Test Proc)

Shift Schedule (Shift Sch)

Equivalent Test Weight (Eq Test Wgt)

Indicated dyno horsepower (Ind HP) for twin-roll hydrokinetic dynamometer, or the letters "COEF" for the 48" single-roll electric dynamometer)

The indicated horsepower is checked against the indicated horsepower vs. actual horsepower table located on each dyno. The actual horsepower is available on the VSR.

10.1.2 Ensure that the following information matches corresponding entries on Form 708-01:

Test number

Driver Identification Number (Driver ID)

Dynamometer Site Number (Dyno Site)

10.1.3 Ensure that all out-of-tolerance events have been addressed and the "STARTUP" times are less than 10 seconds.

10.1.4 If there are no omissions, inconsistencies, or errors on the VDA "Summary Report," enter your technician ID number and the date in the designated spaces.

If there are omissions, inconsistencies, or errors on either the VDA "Summary Report" or Form 708-01, notify a VT senior technician.

10.2 Review Form 708-01.

    10.2.1 Ensure that the following information has been entered correctly and agrees with the corresponding data on the VDA "Summary Report" and the VSR:

        Actual Inertia Setting ... Row C, Columns 28-32

        Indicated Dyno HP ...... Row C, Columns 33-36 (Twin Roll Only)

        Odometer .... Row C, Columns 37-42

        Tire Pressure .... Row C, Columns 43-46

        CVS Unit .... Row C, Columns 61-63

        Fuel Container ID .... Row H, Columns 40-45

    10.2.2 If there are no omissions, inconsistencies, or errors in the report, enter your technician ID number on card H, columns 16-20.

    10.2.3 If there are omissions, inconsistencies, or errors in the report, notify a VT senior technician.

10.3 Review Form 707-01.

    10.3.1 Verify that all spaces have been checked, the site operator's ID number and date have been entered, and the following information is consistent with the VDA "Summary Report":

        Vehicle ID #

        Test Number

    10.3.2 If there are no omissions, inconsistencies, or errors on the form, enter your technician ID number and the date in the designated spaces.

    10.3.3 If there are inconsistencies or errors on the form, notify a VT senior technician.

10.4   Review the TAP Printout.

   10.4.1   For Fuel Economy Data Vehicles only, ensure that the dew point is between 42-52 °F. TAP will flag values outside this range. See Attachment H, "Specific Humidity Specifications Range For Fuel Economy Tests" for a chart showing the dew-point endpoints.

   If the dew point exceeds these tolerances, use the dew point and barometer values from TAP and calculate the specific humidity using the Excel "Humidity Calc. 3.0" program. Ensure the specific humidity is 30-70 gr/lb.

   If it is not, the test is void.

   10.4.2   Ensure that all other TAP flags have been addressed as described in the TAP Flag Directory.

   10.4.3   Verify that the saved data have no error stars or missing values in the summary section.

   10.4.4   Verify that all samples were read within the 20-minute time limit.

   10.4.5   Cross reference dyno and vehicle ID information with the VDA summary report to ensure that the correct test number was assigned to the dyno.

   10.4.6   If all items in Steps 10.4.1 through 10.4.5 have been complied with, write "OK," your technician ID number, and the date at the bottom of the TAP printout.

   If all items were not complied with, contact a VT senior technician.

10.5   Review the Ambient Temperature Strip chart.

   10.5.1   If the ambient conditions were monitored on the strip chart, review the strip chart to ensure adherence to the ambient temperature tolerance (68-86 °F).

   10.5.2   Verify that the driver documented on the strip chart when the vehicle was on the dyno, the start of the test, and the end of the test.

10.5.3   Verify that the ET # and Chart Speed entries on the Ambient Temperature label are correct and the following information agrees with the corresponding entries on the VDA summary report:

    Date

    Dyno #

    Test #

    Vehicle ID #

    Tech (Driver) ID #

10.5.4   If there are no temperature violations, omissions, inconsistencies or errors on the strip chart or label, enter your technician ID number and the date in the designated spaces on the label.

10.5.5   If there are inconsistencies or errors on the strip chart or label, notify a VT senior technician.

10.6   If the 48" single-roll electric dynamometer is used, review the following information on the DYNAMOMETER REPORT:

10.6.1   Verify that the inertia (ETW) and the A, B, and C coefficients correspond to the VSR.

10.6.2   If there are no omissions, inconsistencies, or errors on the Dynamometer Report, enter your technician ID number and the date on the report. If there are omissions, inconsistencies, or errors on the Dynamometer Report, notify a VT senior technician.

10.6.3   Verify that the average positive simulation error is less than 0.05% and the average negative simulation error is less than -0.05%.

11. Data Output

11.1 The following items listed in this section are to be placed in the Test Packet unless otherwise noted. Shared data items, such as the analysis strip chart, shall be placed in the test packet with the lowest test number. The technician will then complete Form 801-01 and place it in the other test packet:

TAP printout

"Ambient Monitoring System" strip chart (if used)

Form 707-01

11.2 If the 48" single-roll electric dynamometer is used, the following printouts are generated:

11.2.1 Print of the screen following automatic calibration of the 48" single-roll electric dynamometer when adjustments of the 5 mph "OFFSET" and/or adjustments of the + and - "SHUNT" values are made. The printout is forwarded to C&M.

11.2.2 Test report following parasitic losses calibration of the 48" single-roll electric dynamometer, when a parasitic loss curve is updated. The report is forwarded to C&M.

11.2.3 "DYNAMOMETER REPORT" printout including a plot of average simulation error. This report is placed in the test packet.

12. Acceptance Criteria

The following criteria must be met for the FTP to be valid:

12.1 The TAP printout or "Ambient Monitoring System" strip chart is checked for adherence to the ambient temperature tolerances (68-86 °F); the average dew-point temperature must be within 35-55 °F. The dew point limits are for Fuel Economy Vehicles only.

12.2 Vehicles tested according to the 1978 test sequence and not scheduled for evaporative emissions testing shall be placed on a dynamometer and the engine started for the "Exhaust Emission Test" procedure within 1 hour of completion of the diurnal heat build.

12.3   The vehicle shall have been soaked for not less than 12 hours nor more than 36 hours prior to the start of the cold-start exhaust emission test.

12.4   For 1996 test sequence vehicles being tested for evaporative emissions, the evaporative canister must be preconditioned during the 12- to 36-hour soak period.

12.5   Ambient temperatures encountered by the test vehicle must remain within 68-86 °F at all times.

12.6   The VDA trace must be within the following UDDS speed tolerances:

    12.6.1   The upper limit is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time.

    12.6.2   Speed variations greater than the tolerances (such as may occur during gear changes, etc.) are acceptable provided they are less than 2 seconds in duration.

    12.6.3   Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc.

    12.6.4   Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.

12.7   The dynamometer inertia simulation must be set to the exact inertia value specified for the vehicle on the "Vehicle Specification Report."

12.8   The twin-roll hydrokinetic dynamometer loading must be set to the exact indicated horsepower.

12.9   The 48" single-roll electric dynamometer must be set to the correct inertia and A, B, and C coefficients.

12.10   The 48" single-roll electric dynamometer average positive simulation error must be less than 0.05% and the average negative simulation error must be less than -0.05%.

12.11   If the dynamometer has not been operated during the two-hour period immediately preceding the test, it shall be warmed up for 15 minutes by operating at 30 mph using a non-test vehicle or as recommended by the dynamometer manufacturer.

12.12   The driver shall have turned the ignition key on and started cranking the engine for the hot start test between 9-11 minutes after the end of the sample period for the cold-start test.

These criteria must be met for the HFET to be valid:

12.13   Ambient temperatures encountered by the test vehicle must remain within 68-86 °F at all times.

12.14   The sample VDA trace must be within the following HFEDS speed tolerances:

12.14.1   The upper limit speed tolerance for the HFEDS preconditioning cycle trace is 4 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 4 mph lower than the lowest point on the trace within 1 second of the given time (per EPCN 33).

12.14.2   The upper limit for the HFEDS cycle trace is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time.

12.14.3   Speed variations greater than the tolerances (such as may occur during gear changes, etc.) are acceptable provided they occur for less than 2 seconds on any occasion.

12.14.4   Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc.

12.14.5   Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

12.15   The dynamometer inertia simulation must be set to the exact inertia value specified for the vehicle on the "Vehicle Specification Report."

12.16   The twin-roll hydrokinetic dynamometer loading must be set to the exact indicated horsepower.

12.17   The 48" single-roll electric dynamometer must be set to the correct inertia and A, B, and C coefficients.

12.18   The 48" single-roll electric dynamometer average positive simulation error must be less than 0.05% and the average negative simulation error must be less than -0.05%.

12.19   The dynamometer must be warmed according to CFR 86.135.

13. Quality Provisions

13.1   The technician follows the sequence of steps on Form 707-01, recording data as needed.

13.2   The dynamometer inertia weight is verified by the site operator.

13.3   The twin-roll hydrokinetic dynamometer indicated horsepower is verified by the site operator.

13.4   The 48" single-roll electric dynamometer vehicle/dyno class, inertia, and A, B, and C coefficients are verified by the site operator.

13.5   The 48" dyno is made ready for testing by following the 48" single-roll electric dynamometer prep sequence.

13.6   The 48" single-roll electric dynamometer is self-checked during the warmup.

13.7   If the automatic calibration procedure on the 48" single-roll electric dynamometer results in an update of the "OFFSET" or "SPAN" values, a new parasitic loss curve is run.

13.8   If the parasitic losses calibration procedure on the 48" single-roll electric dynamometer results in a change in parasitic loss at any speed point exceeding 1.0 lb, and, if the curve fit r^2 value is 0.996 or greater, the new losses curve is accepted.

13.9   The technician's identification number must appear on all forms and test records, certifying that the data are accurate and complete.

13.10   If the vehicle soak has exceeded the 3 hour limit since the completion of the FTP, it will be preconditioned by operation through one cycle of the UDDS prior to the start of the HFET. If the vehicle been moved outdoors, or to environments where the soak temperature is not controlled, it will be soaked at 68-86 °F for a minimum of 4 hours prior to performing the preconditioning UDDS.

13.11   Deviations from this procedure are documented on Form 902-01. In general, these deviations will void the data. However, the customer may choose to accept the data as variant. To do this, the customer must indicate acceptance by signing and dating Form 902-01.

Sample Collection/Analysis Site Verification

Vehicle ID#: _____   **Test Number:** _____

Test Article Preparation

FTP: _____   HFET: _____

Record last dyno usage time: _____

_____ Verify the following:

Dew-point meter is operating correctly and ambient temperatures are within tolerances.

CVS is in "Choke Flow" and that the sample flow rates are correct.

Analyzer bench filter has been changed.

Sample bags are purged and evacuated and the system has been checked for leaks.

Roll revolution counters are again set up to zero.

Zero, span, sample flow rates are set correctly for each analyzer.

Soltec chart recorder pens work properly and there is enough paper for this test.
Verify that the chart recorder pens correspond as indicated below:

Blue=HC   Red=NO_x Green=CO_2 Brown=CO   Purple=Dewpoint

_____ TAP program is activated. The correct test number and vehicle ID entered for each dyno.

_____ VDA Test Information has been entered correctly.

_____ Vehicle on dyno. The remaining checks on this page were completed prior to the FTP.
Go to verify fan operation and complete the remaining required portions of the form.

Test Vehicle Dynamometer Hookup

_____ Tire pressure @ 45 psi or set @ _____ psi

_____ Vehicle restraint system is correctly connected.

_____ CVS is connected to vehicle. Check boots, gaskets, and connecting pipes for leaks.

_____ Exhaust dump in floor (not crimped) and I/M port capped.

_____ Vehicle hood is open and fan(s) positioned within 12 inches of vehicle.

Twin-Roll Hydrokinetic Dynamometer

_____ The correct Indicated Horsepower is selected and Inertia Weights are engaged.

_____ The dyno brake is disengaged and vehicle is centered on dyno.

_____ The roll selector switch is in Rear Roll position.

48" Single-Roll Electric Dynamometer

_____ The roll brake is off, cradles are down and roll is not moving.

_____ The correct inertia and A, B, and C coefficients are entered on RTM-200 Computer.

_____ The dyno is in "RUN MODE" and contactor is engaged.

Form 707-01: 02-01-99

Sample Collection/Analysis Site Verification

Vehicle ID#: _____   **Test Number:** _____

_____ Verify fan operation. Indicate fan placement:
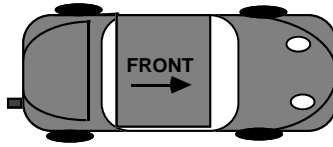
_____ Verify vehicle is in neutral, all accessories are off, and starting instructions are available.

When analyzer operator is ready, signal the driver to open the test menu and select "SET UP FOR DRIVING." Verify that the CVS blower and pumps are on and that the VDA indicates the system is "READY."

FTP test
If this form is being used for the HFET, this section does not need to be completed.

_____ Bag 1 CVS sample flow rate is within 13-20 scfh.

_____ Bag 2 CVS sample flow rate is within 13-20 scfh.

Ten-Minute Soak

_____ Verify hood is down, fan and CVS blower are off during the 10-minute soak.

Start of 3rd Bag

_____ Verify that the vehicle hood is up and that the fan and CVS blower are on.

_____ Bag 3 CVS sample flow rate is within 13-20 scfh.

HFET
If this form is being used for the FTP, this section does not need to be completed.

_____ Bag 1 CVS sample flow rate is within 13-20 scfh.

Reviewing Summary Report-Editing Driving Events
When the test is completed, enter comments in the summary report, if necessary, and print the VDA summary report . Save the TAP data and ensure that all TAP flags have been addressed.

Signatures

I have performed all steps in accordance with the requirements of Test Procedures 707 and 708 and if applicable, 710.

Technician ID #: _____   Date: _____

The data entries are correct and meet the requirements of Test Procedures 707 and 708 and if applicable, 710.

Verified by: _____   Date: _____

Form 707-01: 02-01-99

FTP Video Drivers Aid Report

```
******************************************************************
*  VIDEO DRIVER'S AID TEST REPORT (1.22b3)           Page  1 of  4  *
*  0195^0000                            Processed: 08:11:34 01/30/95  *
******************************************************************


     -- Test and Vehicle Information --
Test Sch:  0195^0000              Mfr:
Shift Sch: A474-0001              Veh ID:
Drive Sch: FTP(Cert)             Version:      00
Test Type: 01                    Eq Test Wgt:3875
Test Proc: 02                    Ind HP:      7.5
Driver ID: 42145                 Dyno Site:   d001
Key Start: 07:22:33 11/33/94

     -- Test Control Events --
          clock              event
 trace     time     test      time     CVS
 time      stamp   control  seconds   status
------  --------  --------  -------  --------
    .0            SETUP
    .0  07:21:48  CVSWAIT1     2.9  EOT
    .0  07:21:51  READY        4.1  RDY
    .0  07:22:33  STARTUP      2.6  BAG 1
    .0  07:22:36  DRIVE      505.0  BAG 1
  505.0 07:31:01  DRIVE      864.0  BAG 2
 1369.0 07:45:25  SHUTDOWN     1.8  BAG 2
 1369.0 07:45:27  DELAY        5.0  BAG 2
 1369.0 07:45:32  HOT SOAK   540.0  SOAK
 1369.0 07:54:32  CVSWAIT2     2.7  SOAK
 1369.0 07:54:35  READY       34.4  SOAK
 1369.0 07:55:09  STARTUP      2.7  BAG 3
 1369.0 07:55:12  DRIVE      505.0  BAG 3
 1874.0 08:03:37  FINISHED      .1  EOT


                                    -- Out of Tolerance Data --
     -- Comments --                 last    back           max
  trace                            in tol  in tol  secs   mph
  time      comments               @trace  @trace   out    out
------  ------------------------   ------  ------  -----  -----
 121.2  brakes                     121.4   120.4    5.3    2.0
 396.7  brakes                     396.6   396.8     .2     .0
 396.9  brakes                     396.8   397.1     .2     .0
1794.7  brakes                    1794.6  1794.8     .2     .0
1853.9  over accel                1853.8  1854.1     .3     .1


 I started and drove this vehicle in accordance with the requirements of TP 707.

 Technician ID#:_____    Date:_____

 I have validated the data in accordance with the requirements of TP 707.

 Technician ID#:_____    Date:_____

 test tolerance is +/- 2 mph per CFR 86.115-78(b)(1)(i,ii)
```

HFET Video Drivers Aid Report

```
***********************************************************************
*  VIDEO DRIVER'S AID TEST REPORT (1.22b3)              Page  1 of  3  *
*  0195^0000                               Processed: 08:13:50 01/30/95  *
***********************************************************************

    -- Test and Vehicle Information --
Test Sch:  0195^0000                Mfr:
Shift Sch: A260-0069                Veh ID:
Drive Sch: HWFE(Cert)               Version:      02
Test Type: 01                       Eq Test Wgt:3500
Test Proc: 03                       Ind HP:       6.3
Driver ID: 42131                    Dyno Site:    D001
Key Start: 09:21:47 12/30/94

    -- Test Control Events --
          clock            event
trace     time     test    time     CVS
time      stamp   control  seconds  status
------  --------  -------- -------- --------
    .0              SETUP
    .0 09:21:38  CVSWAIT       4.4  EOT
    .0 09:21:43  READY         4.4  RDY
    .0 09:21:47  STARTUP        .7  RDY
    .0 09:21:48  DRIVE       780.   RDY
 780.0 09:34:48  DRIVE       765.   RUN
1545.0 09:47:33  FINISHED      .1   EOT


                                    -- Out of Tolerance Data --
    -- Comments --                  last    back           max
 trace                            in tol  in tol  secs     mph
 time     comments                @trace  @trace  out      out
------  ------------------------------- ------  ------  -----  -----




I have validated the data in accordance with the requirements of TP 710.

Technician ID#:_____    Date:_____

tol is +/-4 mph from times    .0 to  780.0 per EPCN 33
tol is +/-2 mph from times  780.0 to 1545.0 per CFR 600.109(b)(2)
```

```
                        HORIBA ELECTRIC DYNAMOMETER
                                  CDC-900
                        AUTOMATIC CALIBRATION REPORT

     TEST SITE:    DOO5                      END DATE:    Mar 29 1995
     ARCHIVE REC:  9999                      END TIME:    20:39:20

     LOSSES REC:   228

     COMMENT:

     DIRECTION:    FORWARD

     OFFSET READING SPEED:  5.00 MPH

                 PREVIOUS                 MEASURED                CHANGE
                 _____                 _____                _____

     OFFSET:      -0.75 LBS               -1.00 LBS              -0.25 LBS

     +SHUNT:     1753.0 LBS              1753.1 LBS                0.1 LBS
     +SPAN :     0.2380                  0.2380                -0.0000

     -SHUNT:    -1755.0 LBS             -1754.9 LBS                0.1 LBS
     -SPAN :     0.2382                  0.2382 LBS             0.0000
```

```
                    HORIBA ELECTRIC DYNAMOMETER
                             CDC-900
                    PARASITIC LOSSES REPORT

     TEST SITE:    DOO5                    END DATE:    Mar 29 1995
     ARCHIVE REC:  999                     END TIME:    20:39:20

     PREV LOSS REC: 228

     COMMENT:

     DIRECTION:   FORWARD
                        SPEED          LOSSES          CHANGE
                        MPH            LBS             LBS
                        ____           ____            ____

                         5             0.1            -0.1
                        10             0.3            -0.3
                        15             0.4            -0.6
                        20             0.5            -0.7
                        25             1.0            -0.4
                        30             0.8            -0.6
                        35             1.1            -0.4
                        40             1.6            -0.1
                        45             1.7            -0.2
                        50             2.0            -0.1
                        55             2.4            -0.1
                        60             3.2             0.0

     PARASITIC LOSS CURVE FIT r-SQRD:  0.986

     LOSS CURVE COEFFICIENTS:

                        a:  -0.87      LBS
                        b:   0.047     LB/MPH
                        c:  -0.000016  LB/MPH2
                        d:   0.000016  LB/MPH3

     MAX BEARING MOTOR SPEED: 100.000 MPH
     BEARING LOSSES OFFSET: 0.000 LBS
```

```
                         HORIBA ELECTRIC DYNAMOMETER
                                  CDC-900
                             DYNAMOMETER REPORT

     TEST SITE:    DOO5                     END DATE:     Mar 29 1995
     ARCHIVE REC:  9999                     END TIME:     20:39:20
     TEST NUMBER:  95 9999                  TIME STARTED: 20:14:20
     VIN:
     OPERATOR:     42044


     COMMENT:


     DIRECTION:   FORWARD
     AUGMENTED BRAKING: OFF
     GRADE:  OFF

     INERTIA:      625   LBS

     ROAD LOAD:   8.6   HP@50
             A:     .87   LBS
             B:   -0.0028  LB/MPH
             C:   0.02430  LB/MPH2


     DISTANCE TRAVELED:                  3.920   MILES


     ENERGY TRANSFERRED FROM VEHICLE:   3722.3  HP-S
     ENERGY TRANSFERRED TO VEHICLE:     2130.8  HP-S


     AVERAGE   POSITIVE ERROR:     0.02 %
     AVERAGE   NEGATIVE ERROR:    -0.02 %

                  F O R C E   E R R O R   S T A T I S T I C S


     SPEED RANGE     NUM      MINIMUM      MAXIMUM       AVERAGE    STD DEV
        MPH          PTS      LBS          LBS           LBS        LBS


      5.-.15         24      -3.960         .4          -0.947      1.633
     15.-.25        156      -7.429         .06          0.013      1.316
     25.-.35        132      -3.725         .102         0.063      0.990
     35.-.45         18      -1.813         .891         0.142      1.460
     45.-.55         83      -1.250        1.243        -0.075      0.533
     55.-.65         34      -0.734        0.646         0.112      0.290
     65.-.75          0       0.000        0.000         0.000      0.000
     75.-.MAX         0       0.000        0.000         0.000      0.999


     PARASITIC LOSSES RECORD:  217
     LOSS CURVE COEFFICIENTS:
                    a:     -0.249    LBS
                    b:      0.020    LB/MPH
                    c:      0.000478 LB/MPH2
                    d:      0.000001 LB/MPH3
```

UDDS Specifications

The operator will follow the driving schedule trace as closely as possible, using the minimum accelerator pedal movement necessary to maintain the required speed, and he/she may use the choke, accelerator pedal, etc., where necessary to keep the engine running.

Accelerations shall be driven smoothly and deceleration modes shall be run in gear using the brakes or accelerator pedal as necessary to maintain the desired speed. The upper speed tolerance at any given time for the UDDS is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower speed tolerance at any given time for the UDDS is 2 mph lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they are less than 2 seconds in duration. Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power (MAP) during such occurrences.

If a vehicle fails to achieve the required acceleration rate under wide open throttle (WOT) during the UDDS, the test will be completed and the VT senior technician and a Certification Division (CD) Representative or EPA Task Officer will be notified. The CD representative or EPA Task Officer will then determine the acceptability of the shift schedule.

If the vehicle has an automatic transmission, idle modes shall be run with the automatic transmission in drive and the brakes applied.

If the vehicle has a manual transmission, shift the gears at the points specified on the driving schedule. In cases where the manufacturer recommends special shift points or use of a shift indicator light, an appropriate VDA driving schedule will be provided with the special shift points indicated. The operator shall release the accelerator pedal during each shift and accomplish the shift in the minimum necessary time. For those modes which decelerate to zero, manual transmission clutches shall be depressed when the speed drops below 15 mph, when engine roughness is evident, when engine stalling is imminent, or where noted on special shift schedules. Optional downshifts (the 187-second point and 840-second point on the driver's trace) are made only at the manufacturer's request or to prevent lugging or stalling. Idle modes shall be run with the transmission in gear and the clutch disengaged, except for the first idle.

If the engine stalls during an idle period (other than initial idle), the engine shall be restarted immediately and the test continued. If the engine cannot be restarted before the next acceleration, immediately stop the VDA trace by pressing <Command-Space Bar> and restart the engine. If the engine starts, accelerate the vehicle to required point on the VDA trace and immediately restart scrolling of the VDA trace by pressing <Command-S>.

If the engine stalls during some operating mode other than idle, immediately stop the VDA trace scrolling by pressing <Command-Space Bar> (it is not necessary to bring the drive wheels to a stop). The vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule. During acceleration to this point, shifting shall be performed in accordance with CFR 86.128. When the vehicle reaches the required point on the VDA trace, immediately restart scrolling of the VDA trace by pressing <Command-S>. If the vehicle does not restart immediately, attempt to restart the vehicle, cranking for 10 seconds and pausing for 10 seconds, for up to 1 minute. If the vehicle will not restart within 1 minute, notify the VT senior technician. Make no further attempts to restart the vehicle. The test shall be void, the vehicle removed from the dynamometer. Complete Form 902-01, obtain all approval signatures, and file with the data processor.

Single-Roll Dyno Prep Flow Chart
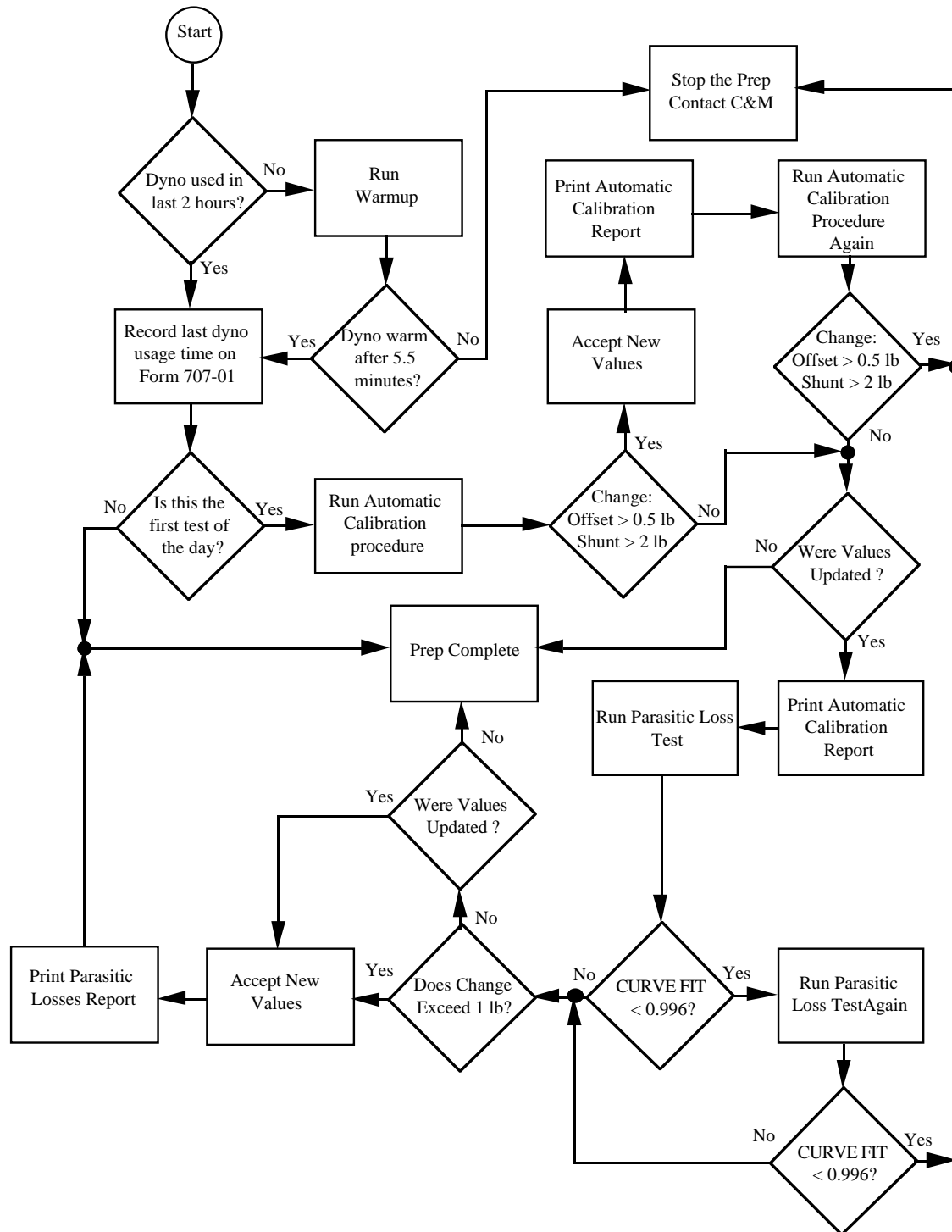
Specific Humidity Specification Range
for Fuel Economy Test

Specific Humidity Spec. Range
30 – 70 gr./lb.

Dew Point – °F

Barometer – " hg
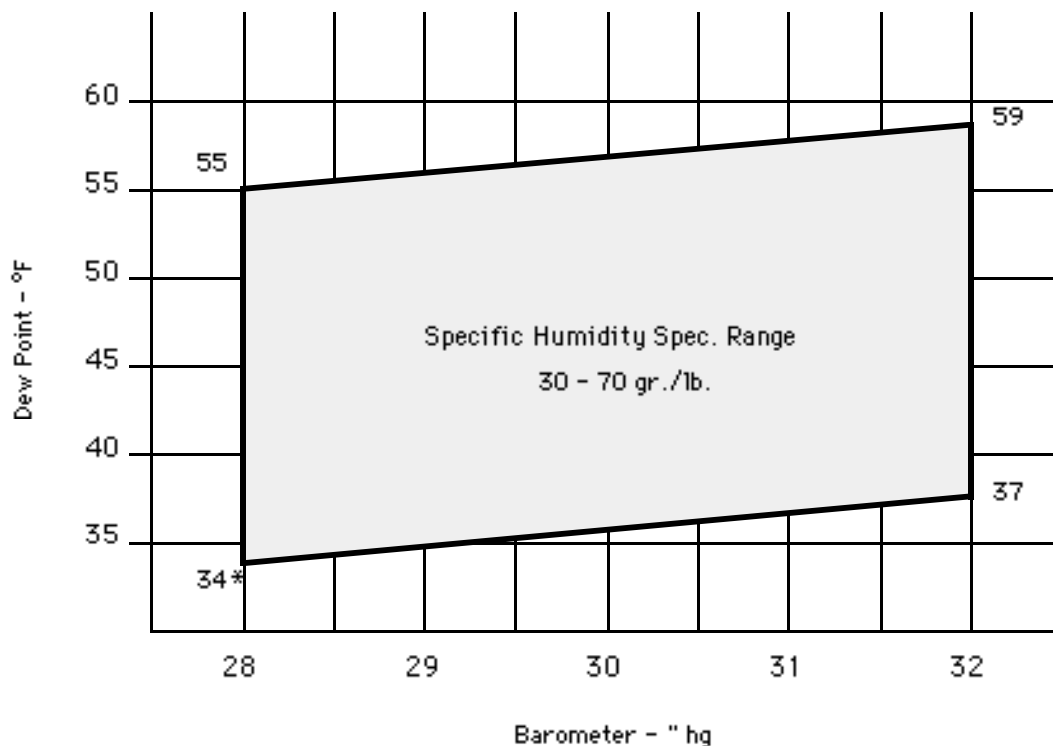
•The endpoints for the dew point are listed on the corners of the spec. range. *If you obtain a reading of 34°F or less on the dew-point hygrometer contact C&M immediately.

•The boundaries for this graph are **not** exact. If you are not certain that a test was performed w/in the specific humidity spec. range contact a senior technician or calculate the exact specific humidity by running the Excel file "Humidity Calc. 3.0" in the VTG Misc. folder on the Vehicle Testing Computer in Room 323E.